ORIGINAL

Jeffrey C. Fereday (Idaho State Bar # 2719)
Michael C. Creamer (Idaho State Bar # 4030)
Deborah E. Nelson (Idaho State Bar #5711)
GIVENS PURSLEY LLP
601 Bannock Street, Suite 200
P.O. Box 2720
Boise, ID 83701-2720
Telephone: (208) 388-1200
Facsimile: (208) 388-1300

Attorneys for Idaho Ground Water Appropriators, Inc.

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DEPARTMENT OF WATER RESOURCES

BEFORE THE DEPARTMENT OF WATER RESOURCES

OF THE STATE OF IDAHO

IN THE MATTER OF THE REQUEST FOR ADMINISTRATION IN WATER DISTRICT 120 AND THE REQUEST FOR DELIVERY OF WATER TO SENIOR SURFACE WATER RIGHTS BY A & B IRRIGATION DISTRICT, AMERICAN FALLS RESERVOIR DISTRICT #2, BURLEY IRRIGATION DISTRICT, MILNER IRRIGATION DISTRICT, MINIDOKA IRRIGATION DISTRICT, NORTH SIDE CANAL COMPANY, and TWIN FALLS CANAL COMPANY	**AFFIDAVIT OF CHARLES M. BRENDECKE, PH.D., P.E.**

STATE OF COLORADO)
) ss.
County of Boulder)

CHARLES M. BRENDECKE, Ph.D., P.E. being first duly sworn on oath, deposes and says:

1. I am President of Hydrosphere Resource Consultants, 1002 Walnut, Suite 200, Boulder, Colorado 80302. I am a licensed professional engineer in Colorado, Wyoming and

Oklahoma. I have a Bachelor of Science degree in civil engineering from the University of Colorado and Master of Science and Doctor of Philosophy degrees in civil engineering from Stanford University.

2. My educational and professional experience is summarized in Exhibit A, which is attached hereto, and incorporated herein by this reference. I have over 30 years of experience in hydrology, water resources engineering and water resources planning and management. I have directed or contributed to several river-basin water management studies that involved detailed inventories of basin hydrology and water demands, as well as development of planning models to investigate implications of changes in hydrology, systems operations and growth in basin water demands. My experience includes historical consumptive use analysis, evaluation of surface and ground water interactions, development of protective terms and conditions for water users, settlement negotiations and expert witness testimony.

3. I have specific experience with modeling hydrologic interconnections between ground and surface water systems in the context of water administration. The following are some representative examples:

a. Hydrologic analysis and review of ground water models simulating effects of specific ground water withdrawals on reach gains on the Pecos River, New Mexico in connection with satisfying New Mexico's interstate surface water delivery obligations to Texas.

b. Hydrologic analysis of natural flow, storage and ground water supplies in the North Platte River Basin in Colorado, Wyoming and Nebraska with emphasis on the effects of ground water withdrawals and changes in irrigation methods on return flows and reach gains in surface streams.

c. Consultant to ground water users concerning development of plans of augmentation (similar to mitigation plans) pursuant to Colorado administrative rules concerning the maintenance of certain Arkansas River flows under the interstate compact between Colorado and Kansas for the Arkansas River.

4. My professional experience also includes study and modeling in the Snake River basin. I served as consultant to National Marine Fisheries Service on a study analyzing alternative water supplies in the Snake River Basin above Lower Granite Dam to promote juvenile anadromous fish migration. My study included review of water use in the Snake River basin and computer model evaluation of potential water management strategies. I have served as a technical advisor to ground water users on Idaho's Eastern Snake River Plain in various matters, including studies of historical irrigation practices and modeling of surface and ground water interactions on the eastern Snake River Plain, since 1998. For the last several years I have participated in technical review of the development, by the Idaho Department of Water Resources, of a new ground water model (the "ESPA Model") of the Eastern Snake Plain Aquifer ("ESPA") that was completed in early 2004. The ESPA Model represents a refinement and recalibration of a prior ESPA model that was calibrated only to one year—1980 (the "1980 ESPA Model").

Hydrology of the Upper Snake River Basin and the ESPA

5. Exhibit B shows some of the principal hydrographic features of the upper Snake River basin and the outline of the ESPA. The ESPA covers an area of approximately 15,000 square miles, and has been estimated to contain as much as 120 million acre-feet ("MAF") of water in its upper 200 feet.

6. Because of its vast storage capacity, the ESPA effectively constitutes the largest reservoir in the upper Snake River basin.

7. Studies in 1980 by the U.S.Geological Survey estimated the average annual recharge to the ESPA to be approximately 8 MAF per year. Exhibit C, which is taken from these USGS studies, shows that the components making up this annual recharge consist of precipitation (0.7 MAF per year); river losses (0.7 MAF per year); other stream and canal losses (0.4 MAF per year), underflow from tributary basins (1.4 MAF per year) and incidental recharge, primarily from surface water irrigation (4.8 MAF).

8. It is generally believed that incidental recharge to the aquifer has decreased somewhat since 1980 as irrigators have continued to convert from gravity to sprinkler application methods. This continuing trend in conversion to sprinkler use is corroborated by information recently submitted by members of the Surface Water Coalition (SWC) in response to the Director's February 14, 2005, Request for Information.

9. Importantly, the recharge inputs other than incidental recharge account nearly half of the total average annual recharge, and are primarily climate driven. Consequently, changes in annual weather and climatic conditions do have significant effects on total annual recharge to the ESPA and, presumably, resulting discharges to the Snake River. Exhibit D, which is reproduced from a presentation made by Donna Cosgrove to the Interim Legislative Committee on August 5, 2004, illustrates the importance of climatic conditions, showing the relationship between net aquifer recharge and precipitation at Aberdeen.

10. Exhibits E and F illustrate the historical climatic and hydrologic conditions of the upper Snake River basin. Exhibit E shows the annual natural flow at Heise for the years 1910-2004. This quantity reflects the water supply available to surface water users in the upper Snake

River basin and thus, indirectly, the supply of incidental recharge to the aquifer. The natural flow at Heise is, however, unaffected by conditions in the aquifer.

11. Exhibit F shows the annual historical values of the Palmer Drought Severity Index (PDSI) for Idaho Climate Division #9, the upper Snake River Plain. The PDSI is a widely used indicator of drought conditions. Negative values of the PDSI correspond to periods of high temperature and low precipitation, while positive values correspond to conditions of lower temperature and higher precipitation. A PDSI value of 0 is "normal," a value of –2 is termed "moderate drought," a value of –3 is termed "severe drought," and a value of –4 is termed "extreme drought."

12. It appears in Exhibits E and F that the severity of cycles of wet and dry periods has increased over time. This is borne out by an analysis of the variance in Heise natural flow shown in Exhibit G. There is a clearly increasing trend in the standard deviation, calculated in moving 20-year blocks, of Heise natural flow starting in approximately 1970. Climate researchers have noted similar trends in other river basins in the western United States (e.g., Jain, Hoerling and Eischeid, 2005).

13. I have reviewed the October 29, 2004, memorandum and spreadsheet analysis prepared by Bill Ondrechen of the IDWR. The subject of the memorandum is "Examination of drought length and severity for ESRPA model studies." The spreadsheet contains the data and calculations described in the memorandum. The spreadsheet calculations examine the historical natural flow at Heise using generally accepted engineering methodologies for the characterization of drought frequency and severity.

14. Among other things, the Ondrechen analysis identifies the lowest year on record for natural flow at Heise (1977) as well as the lowest consecutive 2-, 3-, 4- and 5-year sequences.

The lowest 2-, 3-, 4- and 5-year sequences all fall within the 2000 to 2004 period. In other words, the last 5 years are the driest of any consecutive 5-year period in the record of Heise natural flow. These 5 years are drier than any consecutive 5-year period in the drought of the 1930s.

15. I have prepared Exhibit H from the natural flow data in the Ondrechen spreadsheet. This exhibit compares the accumulating deficit in Heise natural flow between the first 5 years of the droughts of the 1930s and late 1980s with the current drought, now in its 5th year. At the present time, the current drought exhibits an accumulated deficit nearly 2 MAF greater than had accumulated in the first 5 years of either of the other droughts depicted.

16. Exhibit I shows the annual discharge from the ESPA as estimated in the 1980 USGS studies. At that time the average annual discharge from the ESPA was estimated to be approximately 8.2 MAF, consisting of approximately 7.1 MAF of discharges to the Snake River through springs and reach gains, and approximately 1.1MAF through ground water withdrawals by pumping. Based on work done by the Idaho Water Resources Research Institute (IWRRI) in the development of the ESPA Model, current net ground water withdrawals from the aquifer are believed to be approximately 2 MAF.

17. At approximately 2 MAF, current estimated ground water withdrawals from the ESPA through pumping remain approximately 1.2 MAF less than the rate of average annual natural recharge and are substantially less than natural discharge from the aquifer.

18. The ESPA is very complex due to its heterogeneous nature. It is comprised of irregular basalts resulting from cooled lava flows that can form large cavities adjacent to impermeable vertical and horizontal faults and layers, making hydraulic conductivity highly

variable. Consequently, river gains and losses from the aquifer are not uniform from place to place.

19. The ESPA is hydraulically interconnected with the Snake River in varying places to varying degrees both above and below Milner Dam. Exhibit B shows the connected reaches of the ESPA with the Snake River above and below Milner Dam.

20. The interconnected reach between Blackfoot and Neeley is important to the water supplies of canals diverting from the river below Neeley. This is because the surface water rights of these canals are generally junior to those of canals diverting above Blackfoot and, consequently, cannot call for administration against canals diverting above Blackfoot. Outside of high runoff periods, the canals below Neeley depend on reach gains in the Blackfoot to Neeley reach for much of their natural flow supplies during the irrigation season, though only the most senior natural flow rights of these canals can be filled in dry years. The Blackfoot to Neeley gains also contribute to the fill of American Falls Reservoir.

21. Exhibit J shows the historical reach gain between the near Blackfoot and Neeley streamflow gages. The gains for the period from 1928 – 2004 were obtained from hydrologists at IDWR headquarters in Boise. The gains for the period from 1912 – 1933 were obtained from a 1933 report by Lynn Crandall found in the records of the Eastern Regional Office of the IDWR in Idaho Falls. The average annual reach gain over the 1912-2004 period of record is approximately 2500 cfs.

22. There is a period from 1928-1933 where the Crandall data on Exhibit J overlaps the current IDWR gains data. This period corresponds to the initial years of operation of American Falls Reservoir. The differences in gains for this overlap period are most likely due to different approaches in addressing reservoir storage effects in making the gains calculations.

23. It is evident from Exhibit J that the reach gains show variability from year to year and that years of low reach gain early in the period of record are comparable to low years in the recent record. As shown on Exhibit K, the Blackfoot to Neeley gains are strongly related to the values of the PDSI. Similar relationships between climate and spring flows are evident in Exhibits L and M which show the correspondence between aquifer discharge to Spring Creek and in the Thousand Springs Reach, respectively, and the PDSI.

THE ESPA MODEL

24. The new ESPA Model was developed by researchers at the IWRRI over the period 2000-2004. An oversight committee, the Eastern Snake Plain Hydrologic Modeling Committee (ESHMC), provided review and guidance to the researchers during this development process. I served on the ESHMC as a technical representative of ground water user interests.

25. The model relies on a computer code known as MODFLOW and was calibrated, using an automated calibration routine known as PEST, to observed water levels and reach gains for the period 1980-2002. The approaches and codes used in this development and calibration are generally accepted in engineering practice. It is my opinion that the ESPA model provides a reasonable tool for evaluating ESPA hydrology.

26. The development of the ESPA model was accompanied by extensive field data gathering activities. These included mass measurements of aquifer water levels across the ESPA. Exhibits N, O and P, which are reproduced from a presentation made by Donna Cosgrove to the Interim Legislative Committee on August 5, 2004, compare measured aquifer water levels in 1980 (the original USGS studies) with those obtained in the spring of 2001 and the spring of 2002. The comparisons clearly demonstrate the sensitivity of aquifer water levels to the recent drought. There was very little net change in aquifer water levels between 1980 and 2001. In fact, in the spring of 2001 water levels in the vicinity of American Falls Reservoir were

actually higher than they were in 1980. Between 2001 and 2002 there were substantial declines in water levels in many areas, indicating that most of the 1980-2002 change is attributable to the drought.

27. The ESPA Model is a tool that can be used to predict, among other things, the incremental effects on the aquifer, and on hydraulically connected surface water sources, of changes in ground water withdrawals from the ESPA and of changes in irrigation practices that affect recharge to the ESPA.

28. The ESPA model has been used by the IWRRI researchers to run a number of scenarios depicting the effects of various changes in water use and management on the ESPA. One of these scenarios is known as the Base Case scenario. This scenario essentially asks what would happen if the water use and management practices reflected in the calibration period were to continue indefinitely into the future.

29. Exhibit Q is a graph from the IWRRI report describing the Base Case scenario. It indicates that the aquifer is approaching a condition of dynamic equilibrium with current levels of ground water use, but that cycles of wet and dry years will cause aquifer discharges to vary considerably around an equilibrium value.

30. The ESPA Model was also used by the IWRRI researchers to examine the effects of curtailment of pumping under ground water rights junior to various priority dates. This curtailment analysis indicated, among other things, that pumping under rights junior to 1870 (a surrogate for the very senior priorities of the Surface Water Coalition canals, relative to ground water rights) caused a reduction of 1,088 cfs to the near Blackfoot-Neeley reach gain and that 90% of this reduction would be realized within 36 years. This modeled reduction is roughly 40% of the observed long-term average reach gain.

RELATIONSHIPS BETWEEN GROUND WATER WITHDRAWALS AND REACH GAINS IN THE NEAR-BLACKFOOT TO MILNER REACH OF THE SNAKE RIVER

31. Certain of the canals diverting below Neeley, acting as the Surface Water Coalition (SWC), have alleged that ground water withdrawals from the ESPA have diminished their water supplies, in particular by reducing reach gains between Blackfoot and Neeley. In part, this allegation rests on the results of the curtailment scenarios described above.

32. Exhibit R shows the accumulated diversion rate of ground water irrigation permits issued in the ESPA, based on data obtained from the IWRRI modeling group. The vast majority of ground water permits were issued over the 1950-1990 time frame. A moratorium on new permits has been in place since 1992.

33. Superimposed on Exhibit R is a line showing the Blackfoot-Neeley reach gain from Exhibit J. If these reach gains were affected by ground water withdrawals, particularly to the degree predicted by the curtailment scenarios, it would be reasonable to expect to see some change in the observed reach gain as ground water permits accumulated over time. There is no such change apparent, and there is no statistical correlation between the accumulation of permitted ground water diversions and the historical variation in near Blackfoot – Neeley reach gain.

34. A well known way to assess whether there have been changes to the hydrologic regime between two gaging stations is a technique known as double-mass analysis. This technique plots the accumulated flow of the upstream and downstream gages through time. Changes in regime, such as decreased reach gains, are evident as changes in slope of the double-mass line.

35. Exhibit S is a double-mass plot of the combined flow of the Snake River at the near Blackfoot gage and the flow of the Portneuf River versus the flow at the near Minidoka

gage. If increasing ground water pumping over the 1950-1990 period were depleting the gains in this reach, one would expect to see the plotted line veer increasingly to the right over that time period. However, there is no apparent change in slope of the double-mass plot over the 1950-1990 period of ground water development.

36. I also examined the reach gain data portrayed in Exhibit J to see if the average reach gain before 1960 was statistically greater than the average reach gain since 1960. If ground water pumping were depleting these reach gains, one might expect the gains since 1960 to be smaller. There was no statistically significant difference in mean reach gains before and after 1960.

37. I also calculated trend lines in the reach gain data reasoning that if ground water pumping were depleting these reach gains there would be a downward trend in the gains over time. Exhibit T shows the trend line for the entire period of record, illustrating the fact that the reach gains have been virtually unchanged since the time that canal companies' natural flow rights were first appropriated. Furthermore, I found no statistically significant trend in the reach gains data for the period 1960-1999, when the effects of ground water pumping should be most evident. Only when the last four years of drought were included could a meaningful downward trend be determined. This and the preceding analyses support my opinion that the current decreases in near Blackfoot – Neeley reach gain are driven by drought conditions and not by ground water pumping.

38. The ESHMC discussed the apparent discrepancy between ESPA Model results for the curtailment scenarios and the absence of substantial change in the observed reach gains. At least two theories were put forth to explain this apparent discrepancy. One theory was that other factors, such as incidental recharge, might combine to offset the effects of ground water

withdrawals on the observed reach gain. Another theory was that local hydrogeologic features of this part of the ESPA might exert some kind of hydraulic control that keep aquifer discharge to the reach at relatively constant levels. The Committee did not reach any final conclusion on the matter.

39. Although there is no apparent correlation between the near Blackfoot – Neeley reach gains and development of ground water pumping on the ESPA, the variation in reach gains is closely related to climatic conditions, as expressed in the PDSI, as shown on Exhibit K. Similar climatic influences were shown on Exhibits L and M. These three exhibits highlight the fact that changes in reach gains and spring flows are dominated by drought and wet cycles.

HISTORICAL WATER SUPPLY CONDITIONS AND USE BY SURFACE WATER USERS IN THE AMERICAN FALLS REACH (AFR)

40. The Director's March 10, 2004 Amended Order in the Matter of Distribution of Water to Water Rights Nos. 36-15501, 36-02551 and 36-07694 (the "Rangen Order") stated that Rangen was "not entitled to a water supply that is enhanced beyond the conditions that existed at the time such rights were established" Amended Order at 13.

41. Based on this finding, I have reviewed data and other public records maintained at the Idaho Department of Water Resources and the U.S. Bureau of Reclamation concerning the historical water supplies available to the several members of the Surface Water Coalition and the water supplies that were anticipated in planning reports developed in connection with construction of Palisades and Minidoka North Side Pumping projects.

42. Exhibit U is a location map that shows the locations of the points of diversion for the seven petitioning canal companies as described in water right records on file at the IDWR. These points of diversion all are within the AFR.

43. Exhibits V and W summarize information derived from District 1 accounting records related to the natural flow and storage rights held by the seven petitioning canal companies. None of these rights have yet been adjudicated in the Snake River Basin Adjudication.

44. Exhibit X shows the natural flow rights of the canal companies sorted by priority. It also shows their cumulative natural flow rights. It is interesting to compare the 14,000+ cfs of cumulative natural flow rights of the seven canals with the average annual Blackfoot-Neeley reach gain of 2500 cfs. This comparison suggests that only the most senior of the natural flow rights, those appropriated in 1900 and 1903, could ever have expected to be able to depend on natural flows arising below Blackfoot. The more junior rights must always have depended on flood flows passing Blackfoot from upstream reaches.

45. Exhibit Y shows how the 1905 natural flows at Montgomery Ferry would have been distributed among the water rights of the seven canal companies. The Montgomery Ferry gage was located about 6 miles downstream of the near Minidoka gage. In 1905 the flow of the Snake River at this location was unaffected by storage in any upstream mainstem reservoirs. It essentially represents a natural flow supply. It is evident from Exhibit Y that the natural flow rights of the A&B Irrigation District and the American Falls Reservoir District #2 would have been out of priority for the entire irrigation season. The rights of the Milner Irrigation District would have been in priority only in June. Only the most senior natural flow rights of the North Side and Twin Falls Canal Companies would have been in priority through the entire irrigation season, though they would not have been fully satisfied after July. From this analysis I would conclude that the members of the Surface Water Coalition must have been fully aware at the time

of their appropriations that their natural flow supplies would yield only limited amounts of water, and in some cases no water, during dry years.

46. The PDSI value for 1904 was –0.4 and in 1905 was –1.0. The PDSI values for the years 2000-2004 were, respectively, –3.3, -4.9, -3.9, -4.7 and -2.6. The current dry spell is substantially worse than conditions in 1905. It is reasonable for the canals in the Surface Water Coalition to expect their natural flow rights to have very little yield under such conditions.

47. I have reviewed the October 1946 Project Planning Report on "Water Supply for the Palisades Reservoir Project, Idaho" prepared by the U.S. Bureau of Reclamation (USBR) (hereafter "Palisades Report"). This report is in the files of the IDWR and is the type of report prepared by the USBR in connection with the planning and development of water resources projects. The report evaluates the need for and benefits from the construction of Palisades Reservoir and implementation of the Winter Water Savings Program (hereafter "Palisades Project").

48. Two alternative future plans are evaluated in the Palisades Report. Plan A contemplates that the Palisades Project will be used only to supply water to existing irrigated lands. Plan B contemplates that the Palisades Project will serve existing irrigated lands plus new lands under the Ft. Hall Michaud Division and the Minidoka North Side Pumping Division. The Palisades Report contains operations studies of the prospective water supplies that would be provided by the Palisades Project under each of the two plans; these operations studies used a hydrologic study period from 1919 through 1942.

49. Palisades Reservoir was completed in 1957. The Winter Water Savings Program began operation in 1961. The Minidoka North Side Pumping Division was completed in 1959 and turned over to the A&B Irrigation District for operation in 1966. With the exception of Ririe

Reservoir, the current configuration of reservoirs and canals in the upper Snake River Basin is essentially as was depicted in Plan B of the Palisades Report.

50. The operations study of Plan B in the Palisades Report found that, even with the increased water supply provided by the Palisades Project, canals diverting from the Snake River below Neeley would still suffer shortages of water in very dry years. The operations study projected diversion shortages of 803,000 acre-feet in 1934 and 157,000 acre-feet in 1935 with both Palisades and American Falls Reservoirs in operation. The operations study also projected that American Falls Reservoir would have failed to fill in those years. The report concluded (p. 154) that "Neither of these shortages would have caused serious crop loss."

51. Based on my review of the Palisades Report I would conclude that the beneficiaries of the Palisades Project reasonably anticipated the shortages of storage water resulting from the current drought that they now seek to attribute to ground water users. The only way to justify their requested curtailment of ground water uses is if their objective is to increase the supply above what they historically would have had under similar conditions.

52. I also reviewed the *April 1949 Project Planning Report for the Minidoka North* Side Pumping Division (also in the IDWR library), now operated by the A&B Irrigation District, a member of the Surface Water Coalition. This planning report recommends (pp. 43-44) that the surface water-supplied portion of the Division be limited to 12,830 acres and that it be planned to deliver 3.25 acre-feet per acre at the farm headgates. This would translate to a total annual headgate delivery requirement of 41,700 acre-feet. Materials submitted in response to the Director's February 14, 2005, Request for Information, indicate that the A&B Irrigation District has had an average annual headgate delivery of 46,500 acre-feet over the period 1990-2004. The minimum annual headgate delivery over this period was 41,400 acre-feet.

53. The Minidoka North Side Pumping Division report also contains an operations study similar to that described for the Palisades Project. This operations study anticipates that the surface water supplied portion of the Division would divert only 42,000 acre-feet in the then critical drought period (1930s). The minimum diversion to the A&B Irrigation District over the 2000-2004 period is 50,100 acre-feet.

54. Exhibit Z shows the historical storage allocations to the American Falls Reservoir District #2 (AFRD#2) derived from records of the District 1 Watermaster. AFRD#2 has storage rights only in American Falls Reservoir, so its record of allocations is unaffected by the development of additional storage in Palisades. The initial storage allocation is the amount of storage water assigned to each storage spaceholder on the day the reservoir system achieves maximum fill. Exhibit Z reveals that the AFRD#2 storage allocation has been very reliable and that its allocations in recent years have been essentially the same as they were in the early years of the project. Shortages in recent dry years are no different from those experienced in the drought of the 1930s or in 1961 (lower allocations in the mid-1970s were related to reservoir reconstruction).

55. Exhibit AA shows the initial storage allocations of all seven of the SWC members since 1960. The effects of periodic dry spells are evident, as are the effects of American Falls reconstruction in the 1970s. However, the allocations in 1961 are not materially different from those in the current drought and allocations are remarkably stable over the period.

56. Exhibit BB contains charts of the annual natural flow and storage diversions by the North Side and Twin Falls Canal Companies for the period 1960-2003, taken from District 1 Watermaster reports. Several things are evident from these graphs: 1) there is no downward trend in diversions that might be attributed to increasing ground water depletions over this 44-

year period, 2) the distribution of diversions as between natural flow and storage, though variable, does not show a trend, and 3) the reduced diversions in the most recent years are no lower than they were in 1961, when the ground water development was in its early stages.

57. Exhibit CC shows the annual diversions of the seven SWC members expressed in acre-feet per reported acre. Again there do not appear to be any significant reductions in these rates except during drought years. Also shown on Exhibit CC is the range of crop irrigation requirement for crops typically grown in the area, and a line representing the comparable diversion rate of ground water users as reflected in the ESPA model. Comparing these with the SWC members diversion rates suggests that the surface water users have substantially more room to adapt to variations in supply than do ground water users and still meet crop requirements.

58. Exhibit DD is a table summarizing information derived from the IDWR concerning the historical water bank activities, including leases, purchases and quantities involved for the Coalition members since 1960. Analysis of records prior to 1960 are complicated by the change in storage space that came with construction of Palisades Reservoir.

59. Absent direct data concerning actual annual on-farm and service area-wide water requirements for the individual Coalition members, historical data concerning water bank activity and other water transactions by and among Coalition members can be useful in estimating their annual water availability and beneficial use requirements. Because these transactions do have direct adverse effects on entities leasing their storage to others under last-to-fill requirements or failure-to-fill drought conditions and because they can cause external adverse effects on other storage spaceholders, this historical data also can be helpful in evaluating the

extent to which such transactions in one or more years may be the cause of reduced water supplies to Coalition members in subsequent years.

60. Exhibit DD shows that since the formal adoption of the water bank in 1979, many of the members of the Surface Water Coalition have been regular contributors to the bank, a behavior which suggests they had excess supplies in most of those years. Exhibit DD also shows that the maximum combined amount leased from the bank by Coalition members in the 1966 is not substantially different from the maximum leased in any recent year.

61. Exhibit EE shows the annual flow passing Milner Dam for the period 1928-2002. An analysis of the mean flow before and after 1960 reveals that the average flow since 1960 is roughly 1 MAF greater than the flow before 1960. I would have expected the opposite to be true if depletions by ground water users were causing regular shortages to the SWC members.

62. Based upon my review of the above data in Exhibits A-EE, and the facts stated in the Director's Orders, etc. I am of the following opinions:

a. Ground water depletions are not the cause of the declines in measured reach gains between the Near Blackfoot Gage and the Neeley Gage since 1999

b. There has been no significant trend or change, either up or down, in the reach gain contributions to the water supply of Coalition members over the 97 year period of record.

c. Declines in reach gains since 1999 are the direct result of the record-setting, five-year period of drought.

d. Current levels of natural flow and storage supplies available to the Coalition members as the result of the instant drought are consistent with the levels of reductions in those supplies that would have occurred, and did occur, historically under similar climatic conditions and prior to the time when the effects of ground water pumping would have been expressed in reach gains.

e. The existing storage system that includes Jackson Lake, Palisades and American Falls reservoirs would not have prevented water shortages to Coalition members under climatic conditions similar to the current drought but that occurred prior to ground water development.

f. When storage appropriations were made and the projects were completed, they were not intended to provide a full supply of water during the kind of drought conditions currently being experienced.

g. But for historical changes in surface water use instituted by surface water users themselves, reach gains to the AFR might well exceed the historical reach gains that existed when the Coalition members made their appropriations, despite the effects of ground water development.

MODELED EFFECTS OF GROUND WATER CURTAILMENT ON AFR REACH GAINS AND USEABLE SURFACE WATER SUPPLIES

63. I have made runs of the ESPA model to determine the transient and steady state hydrologic benefits to the AFR from curtailment of ground water pumping junior to the water rights of the Surface Water Coalition by members of existing ground water districts and by all ground water users. Exhibit FF is a map showing the ground water irrigated lands in the ESPA Model and distinguishing the lands served by existing districts that are members of the Idaho Ground Water Appropriators, Inc. (IGWA). Exhibits GG and HH show the model cell stresses that were used in performing these model runs.

64. The increased reach gain in the first irrigation season and first year, from these curtailments, are summarized in Exhibit II. The curtailment of junior rights held by ground

water district members would produce an increased reach gain above Milner Dam of 65,000 acre-feet during the 2005 irrigation season. The increased reach gain from curtailment of all junior pumping would be 85,000 acre-feet.

65. Predicted increases to reach gains during the irrigation season represent the maximum amount of water that conceivably could be diverted for beneficial use this year to the extent that Coalition members do not have a full supply. Predicted increases to reach gains after the irrigation season represent water that conceivably could be stored and diverted to beneficial in subsequent years to the extent that the gain is expressed above an existing reservoir and provided the reservoir system does not fill and spill next year.

66. The increased reach gain of 85,000 acre-feet in the 2005 irrigation season comes at the expense of curtailment of 1,985,000 acre-feet of ground water use. Even if the entire reach gain were to be usable, which is unlikely, this represents only 4% of the amount of use foregone through curtailment.

67. Assuming a diversion of six acre-feet per acre (typical of that diverted by SWC members), the dry-up of 1.1 million acres of ground water irrigated land would generate enough water to supply approximately 14,000 acres of SWC land.

68. Exhibits JJ and KK show the transient increase in reach gains above Milner that would result from permanent curtailment of all ground water rights junior to 1/1/49 (Exhibit JJ) and 1/1/61 (Exhibit KK). These exhibits illustrate that the benefits of curtailment sought by the SWC can only be realized by permanently curtailing ground water pumping and waiting for decades.

69. The usability of reach gains emanating from curtailment was specifically examined by the IDWR in late 2004. Department hydrologists used the Snake River Basin

Planning Model to assess the fate of a hypothetical reach gain increase in the Shelley to Minidoka reach of 888 cfs (643,000 acre-feet/year). This corresponds to the steady state gain from curtailment of all ground water rights junior to January 1, 1961. Exhibit LL shows the results of this analysis and reveals that, out of the 888 cfs reach gain, approximately 800 cfs, or 90%, would spill past Milner Dam.

70. Consequently the quantity of water that the ESPA Model predicts would be expressed as reach gains to the AFR from curtailment of ground water diversions does not necessarily reflect the quantity of water that would be made available to senior surface water users in the AFR. To the degree that these reach gains are not usable, the efficiencies of curtailment of ground water uses are even lower than indicated above.

71. As these facts demonstrate, the priority administration system originally designed for surface water systems do not work well with ground water systems. In a surface water system, the amount of water foregone at an administered upstream diversion is fully and immediately (subject to travel time) available to the downstream calling right. In the instant case, the water foregone by ground water users is neither immediately nor fully available to the calling surface water rights.

72. Because curtailing ground water use on the ESPA will have delayed effects on reach gains, and because Coalition members historically have experienced water shortages only rarely and as a result of intermittent drought events, curtailing ground water diversions on a large, or even small scale is not likely to produce meaningful supplies of water during the short-term period when it might be diverted to beneficial use by surface water users. During the long-term, most of the predicted increases in reach gains will be expressed during periods when Coalition members already will have a full supply and/or when the reservoir system will not be

Dated this 23 day of March 2005.

Charles M. Brendecke, Ph.D., P.E.

Subscribed and sworn to before me this 23rd day of March 2005.

Notary Public for Colorado
Residing at 7988 Marshall, Arvada CO 80003
My Commission Expires 12/2/2008

CERTIFICATE OF SERVICE

I hereby certify that on this 23rd day of March 2005, I served a true and correct copy of the foregoing by delivering the same to each of the following individuals by the method indicated below, addressed as follows:

Mr. Karl J. Dreher Director Idaho Department of Water Resources 322 East Front Street P.O. Box 83720 Boise, ID 83720-0098	______ U.S. Mail ______ Facsimile ______ Overnight Mail ✓ Hand Delivery
C. Tom Arkoosh, Esq. Arkoosh Law Offices, Chtd. 301 Main Street P.O Box 32 Gooding, ID 83330	✓ U.S. Mail ______ Facsimile ______ Overnight Mail ______ Hand Delivery
W. Kent Fletcher, Esq. Fletcher Law Office P.O. Box 248 Burley, ID 83318-0248	✓ U.S. Mail ______ Facsimile ______ Overnight Mail ______ Hand Delivery
Roger D. Ling, Esq. Ling, Robinson & Walker 615 H St. P.O. Box 396 Rupert, ID 83350-0396	✓ U.S. Mail ______ Facsimile ______ Overnight Mail ______ Hand Delivery
John A. Rosholt, Esq. John K. Simpson, Esq. Travis L. Thompson, Esq. Barker, Rosholt & Simpson 113 Main Avenue West, Ste. 303 Twin Falls, ID 83301-6167	✓ U.S. Mail ______ Facsimile ______ Overnight Mail ______ Hand Delivery
James C. Tucker, Esq. Idaho Power Company 1221 West Idaho P.O. Box 70 Boise, ID 83707	✓ U.S. Mail ______ Facsimile ______ Overnight Mail ______ Hand Delivery

James S. Lochhead Adam T. Devoe Brownstein, Hyatt & Farber P.C. 410 17th St., 22nd Floor Denver, CO 80202	✓ U.S. Mail ____ Facsimile ____ Overnight Mail ____ Hand Delivery
Kathleen Marion Carr, Esq. Office of the Field Solicitor U.S. Department of the Interior 550 West Fort Street, MSC 020 Boise, ID 83724-0020	✓ U.S. Mail ____ Facsimile ____ Overnight Mail ____ Hand Delivery
E. Gail McGarry, P.E. Program Manager Water Rights & Acquisitions PN-3100 U.S. Bureau of Reclamation Pacific Northwest Region 1150 N. Curtis Road Boise, ID 83706-1234	✓ U.S. Mail ____ Facsimile ____ Overnight Mail ____ Hand Delivery
Scott L. Campbell, Esq. Moffatt Thomas Barrett Rock & Fields, Chtd. 101 S. Capitol Blvd., 10th Floor P.O. Box 829 Boise, ID 83701-0829	✓ U.S. Mail ____ Facsimile ____ Overnight Mail ____ Hand Delivery
Idaho Department of Water Resources Eastern Regional Office 900 North Skyline Dr. Idaho Falls, ID 83402-6105	✓ U.S. Mail ____ Facsimile ____ Overnight Mail ____ Hand Delivery
Idaho Department of Water Resources Southern Regional Office 1341 Fillmore St., Ste. 200 Twin Falls, ID 83301-3033	✓ U.S. Mail ____ Facsimile ____ Overnight Mail ____ Hand Delivery

Michael C. Creamer

CMB Resume

IGWA Exhibit A

HYDROSPHERE
Resource Consultants

Charles M. Brendecke, Ph.D., P.E.

Education:

Ph.D., Civil Engineering, Stanford University, 1979.

M.S., Civil Engineering, Stanford University, 1976.

B.S., Civil Engineering, University of Colorado, 1971.

Years Experience:

With this Firm: 18
With Other Firms: 15

Registration(s) and Membership(s):

Registered Professional Engineer:

State of Colorado, #17578

State of Wyoming, #6960

State of Oklahoma, #21265

American Society of Civil Engineers

American Water Resources Association

American Geophysical Union

American Society of Agricultural Engineers

Soil and Water Conservation Society

EXPERIENCE NARRATIVE

Dr. Brendecke has more than 30 years of diverse experience in hydrology, water resources engineering and water resources planning and management. He has directed or contributed to several river-basin water management studies that involved detailed inventories of basin hydrology and water demands, as well as development of planning models to investigate implications of reservoir systems operations and growth in basin water demands. Several of these studies have involved instream flow and endangered species issues. His work as the project manager and lead expert in a variety of water rights proceedings has included historical consumptive use analysis, evaluation of surface/groundwater interactions, stream depletion analysis, development of protective terms and conditions, settlement negotiations, and expert witness testimony.

As a researcher, he has supervised investigations of rainfall and snowmelt frequency in alpine watersheds, comparative applications of rainfall/runoff models, and hydraulic evaluations of stream habitat enhancement measures. Dr. Brendecke was the project manager and principal author for the development of *Achieving Efficient Water Management, A Guidebook for Preparing Agricultural Water Conservation Plans,* for the U.S. Bureau of Reclamation. Dr. Brendecke has recently served as a testifying expert for water resources analyses in *Nebraska v. Wyoming,* and *Kansas v. Colorado,* before the U.S. Supreme Court.

RECENT PROJECT EXPERIENCE

Columbia River Basin Reservoir Operations. Project manager for studies of the impact of modified reservoir operations on agricultural interests.

New Mexico Surface Water Studies. Project manager for a program of surface and ground water studies on the Pecos and Rio Grande Rivers in support of State initiatives.

Interstate Compact Litigation. Expert witness in litigation between Kansas and Colorado regarding Arkansas River water users.

Snake River Water Rights. Project manager for studies of historical irrigation practices and modeling of surface/ground water interaction on the eastern Snake River Plain, Idaho.

Rio Grande Decision Support System. Quality assurance officer on development of comprehensive surface water model of the Rio Grande River basin in Colorado.

Agricultural Water Conservation. Project manager for development of a water conservation guidebook for use by irrigation districts. The guidebook describes planning approaches and methods for evaluating specific conservation measures.

Colorado City Metropolitan District. Project manager for water supply planning studies and water rights litigation support for municipal water provider.

Interstate Water Litigation. Project manager and expert witness in litigation between Nebraska and Wyoming regarding storage project operations and water deliveries to agricultural users.

Gunnison Basin Planning Model. Project manager for development of an interactive PC-based computer model of the Gunnison River basin. The model uses a network solution algorithm and incorporates a Windows™-based interface.

Boulder Creek Water Rights. Lead expert in a variety of water rights proceedings for the City of Boulder related to applications, changes, and transfers of agricultural rights in the Boulder Creek basin.

Yampa River Basin Planning Studies. Project manager for comprehensive water supply planning study that included demand forecasting, development of a basin computer model, and evaluation of potential water storage project operations.

Snake River Basin Water Supply Study. Project manager for a comprehensive review of water use in the Snake River basin and computer model evaluation of potential water management strategies, including agricultural water conservation, to enhance anadromous fisheries.

Columbus Ditch Transfer. Performed engineering analysis of the historical use of irrigation rights located on the Blue River, determining the portion of consumptive use made possible by Green Mountain Reservoir releases.

Muddy Creek Water Rights. Analyzed the historical consumptive use of the irrigation water rights associated with the Gary Hill Ranch on Muddy Creek, in support of water rights acquisition associated with the construction of Muddy Creek Reservoir.

Summit County Small Reservoir Study. Project manager for a Blue River basin water management study involving development of a hydrologic model and evaluation of new storage facilities for instream flow maintenance.

Gunnison Basin Planning Study. Project manager for development of a detailed hydrology and water rights model of the 8000 square mile Gunnison River basin as part of a comprehensive river basin planning study.

Windy Gap Delivery Study. Developed detailed computer models of Colorado-Big Thompson Project operations to support analysis of the yields of the Windy Gap Project, which shares common facilities.

Superconducting Super Collider Water Supply. Determined industrial water needs and developed the water supply strategy for a proposed Department of Energy physics research facility.

Boulder Raw Water Master Plan. Prepared a comprehensive report concerning water rights holdings and water supply system operating policies for a Front Range municipality of 100,000 persons.

Standley Lake Pollutant Loading. Developed hydrologic and pollutant loading model of Standley Lake to assess relative effects of non-point sources and a proposed effluent exchange by a major industrial water user.

Pecos River Compact. Consultant to the Special Master of the U.S. Supreme Court on technical issues in a lawsuit between Texas and New Mexico concerning river depletions and water deliveries.

Rocky Ford Ditch Transfer. Performed engineering analyses of historic irrigation practices and Arkansas River depletions associated with a 4100-acre tract in southeastern Colorado.

Buena Vista Water Rights. Analysis of the historic use of irrigation water rights and development of engineering data supporting their transfer to municipal use.

Dillon Clean Lakes Study. Development of a comprehensive hydrologic monitoring network to determine lake inflow patterns and non-point source pollutant loadings from various land uses.

Restoration of West Tenmile Creek. Performed hydrologic and hydraulic analysis and design of comprehensive stream habitat improvements at Copper Mountain ski area.

EMPLOYMENT HISTORY

1986-present	Principal and President (1990 to present), Hydrosphere Resource Consultants, Inc. Responsible for management of engineering studies, company development and management, consultant on water rights and water resources planning projects.
1985-1986	Senior Project Engineer, Wright Water Engineers Inc. Responsible for engineering analysis and report preparation on water rights and hydrologic studies.
1979-1985	Assistant Professor of Civil Engineering, University of Colorado. Responsible for teaching and research in areas of water resources and systems analysis.
	Faculty Research Associate, Institute for Arctic and Alpine Research. Directed various research studies in alpine hydrology and meteorology.
	Consultant, U.S. Army Corps of Engineers; Western Environmental Analysts, Inc.; Dietze & Davis, P.C.; Copper Mountain, Inc.; Hydrologic Consulting Engineers, Inc.; Westfork Investments, Ltd.
1975-1979	Research Assistant and Lecturer, Stanford University. Responsible for conducting research and lecturing for undergraduate courses in civil engineering.
1973-1975	Design Engineer, Wright-McLaughlin Engineers, Inc. Performed engineering design of water supply and wastewater collection systems.
1971-1973	Design Engineer, Ministry of Agriculture, Government of Kenya (U.S. Peace Corps). Performed planning and design of rural and domestic water supply systems.

REPORTS AND PUBLICATIONS

Brendecke, C., 2004, "Toward Conjunctive Management of the Eastern Snake Plain Aquifer," poster presentation at Natural Resources Law Center 25th Summer Conference Groundwater in the West, June 16-18, Boulder, CO.

Brendecke, C., 2004, "Interstate Water Conflict: Compacts, Adjudications and Decrees," presentation at Water Policy Seminar: Freshwater Conflicts in the United States, May 19, Stanford, CA.

Brendecke, C., and R.D.Tenney, 2001, "Water Rights, Compact Entitlements and Endangered Fishes of the Yampa River Basin," Proceedings of the Annual Water Resources Conference, American Water Resources Association, November 12-15, Albuquerque, NM.

Brendecke, Charles M., 2001, "Conjunctive Management: Science or Fiction?" presentation to Idaho Water Users Association 18th Annual Water Law and Resource Issues Seminar, November 8-9, Boise, ID.

Tenney, Ray D., and C.M. Brendecke, 1998, "Planning for Water Development and Endangered Species Recovery in the Yampa River Basin." Proceedings of the Wetlands Engineering & River Restoration Conference, 1998, American Society of Civil Engineers, March 26th, 1998, Denver, CO.

Payton, E., C. Brendecke, B. Harding, E. Armbruster, T. McGuckin and C. Huntley. 1997. "Agricultural Water Conservation Planning & Pricing-Tools & Technologies." Proceedings of the Irrigation Association's 18th International Conference, Nov. 2, 1997, Nashville, TN.

Hydrosphere Resource Consultants, Inc., 1996, "Achieving Efficient Water Management: Agricultural Water Conservation Planning," workshop for U.S. Bureau of Reclamation staff, Dec. 16 - 18, Las Vegas, NV.

Brendecke, C., B. Harding and E. Payton, 1996, "PC-Based Decision Support Tools: Lessons from a Dozen Applications," Proceedings of the Fifth Water Resources Operations Management Workshop, Water Resources Planning and Management Division (ASCE). March 4, Arlington, Virginia.

Howe, C.W., M. Smith, L. Bennett, C. Brendecke, J. Flack, R. Hamm, R. Mann, L. Rozaklis, and K. Wunderlich, 1994, "The Value of Water Supply Reliability in Urban Water Systems," Journal of Environmental Economics and Management, 26, 19-30.

Brendecke, C., 1993, "Managing Snake River Operations for Juvenile Salmon Migration," Proceedings of the ASCE Water Resource Planning and Management Conference Division 20th Anniversary Conference, Seattle, Washington, May.

Brendecke, C., 1992, "The Hydrosphere Snake River Operations Model", 9th Annual Water Law and Resource Issues Seminar, Idaho Water Users Association, Boise, Idaho.

Brendecke, C., and B. Harding, 1990, "Logical Intransitivities and Other Administrative Nightmares: Can Models Help?," Proceedings of the 26th Annual AWRA Conference and Symposium, November 4-9, Denver, Colorado.

Harding, B., C. Brendecke, and R. Kerr, 1990, "Legal and Economic Disincentives in the Transfer of Models to Users," Proceedings of the 26th Annual AWRA Conference and Symposium, November 4-9, Denver, Colorado.

Brendecke, C., W. DeOreo, E. Payton, and L. Rozaklis, 1989, "Network Models of Water Rights and System Operations," Journal of the Water Resources Planning and Management Division (ASCE).

Rozaklis, L., E. Payton, C. Brendecke, and B. Harding, 1988, "Modeling Water Allocation Problems Under Complex Hydrologic and Institutional Settings," paper presented at the 24th Annual AWRA Conference and Symposium, November 8, Milwaukee, Wisconsin.

Brendecke, C., W. DeOreo, and L. Rozaklis, 1987, "Water Rights Analysis and System Operation Using Network Optimization Models," paper presented at the 14th Annual ASCE Water Resources Planning and Management Division Conference, March 16-18, Kansas City.

Brendecke, C., E. Payton, and R. Wheeler, 1987, "Network Optimization Models for Water Rights Analysis and System Operating Studies for the City of Boulder," Proceedings of the Colorado Water Engineering and Management Conference, February 17-18, Ft. Collins, Colorado.

Payton, E., and C. Brendecke, 1985, "Rainfall and Snowmelt Frequency in an Alpine Watershed," Proceedings of the 53rd Western Snow Conference, April 16-18, Boulder, Colorado, pp. 25-36.

Brendecke, C., and J. Sweeten, 1985, "A Simulation Model of Boulder's Alpine Water Supply," Proceedings of the 53rd Western Snow Conference, April 16-18, Boulder, Colorado, pp. 63-71.

James, E., and C. Brendecke, 1985, "The Redistribution and Sublimation Loss of Snowpack in an Alpine Watershed," Proceedings of the 53rd Western Snow Conference, April 16-18, Boulder, Colorado, pp.148-151.

Brendecke, C., D. Laiho, and D. Holden, 1985, "Comparison of Two Daily Streamflow Simulation Models of an Alpine Watershed," Journal of Hydrology, 77, pp. 171-186.

Brendecke, C., D. Laiho, and J. Sweeten, 1984, "Management of a Municipally Owned Alpine Watershed Using Continuous Simulation," Proceedings of the 11th International Symposium on Urban Hydrology, Hydraulics, and Sediment Control, July 23-26, Lexington, Kentucky, pp. 79-87.

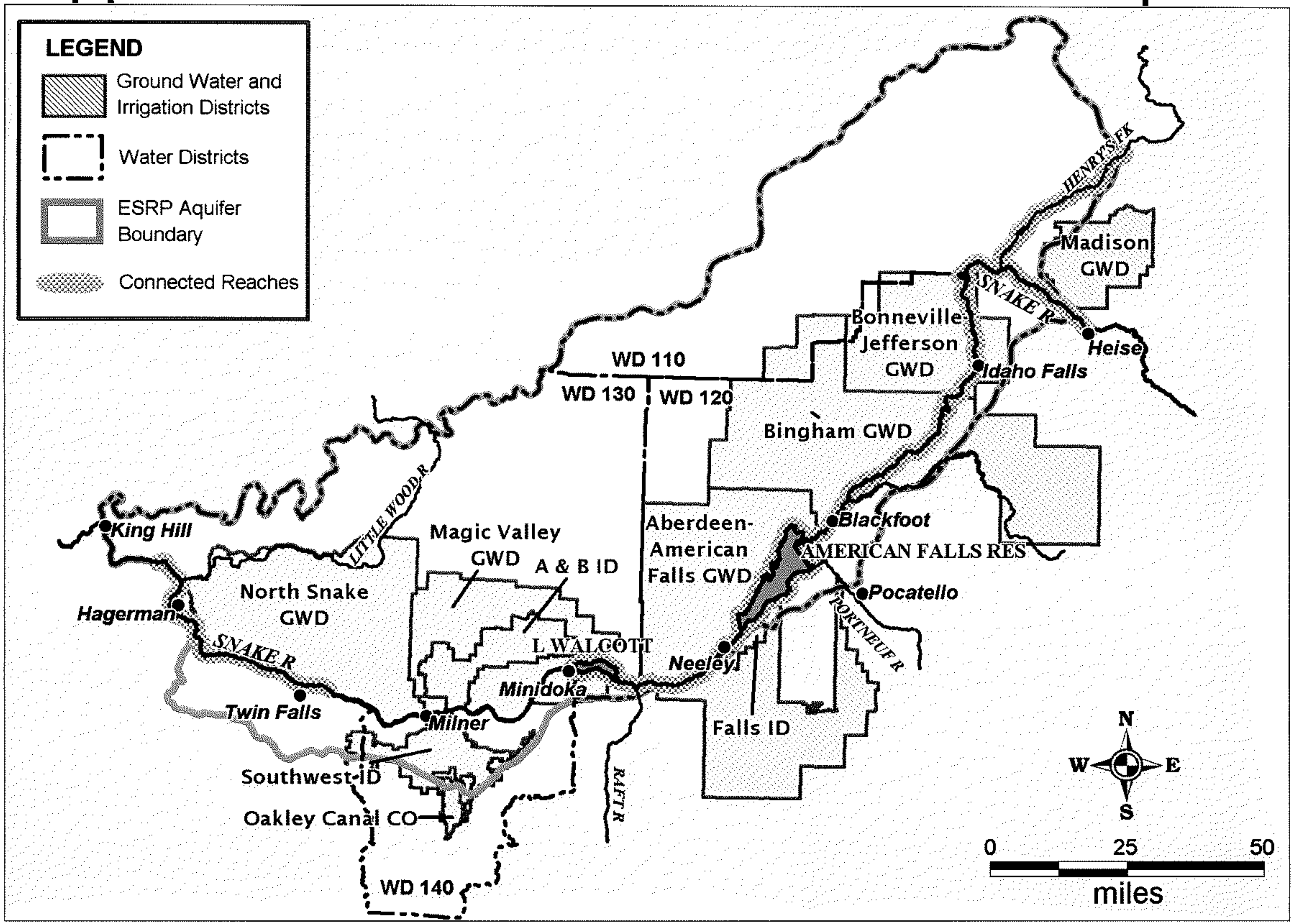
Lewis, W., D. Crumpacker, J. Saunders, and C. Brendecke, 1984, Eutrophication and Land Use, Ecological Studies Vol. 46, Springer-Verlag, New York, 202 pp.

Brendecke, C., D. Laiho, and D. Holden, 1984, "A Comparative Evaluation of Streamflow Simulation Models in a Colorado Alpine and Subalpine Environment," Proceedings of the American Geophysical Union Front Range Branch Hydrology Days, April 24-26, Ft. Collins, Colorado, pp. 40-55.

Baker, F., and C. Brendecke, 1983, "Seepage from Oilfield Brine Disposal Ponds in Utah," Groundwater, 21(3), pp. 317-324.

Brendecke, C., and L. Ortolano, 1981, "Environmental Considerations in Corps Planning," Water Resources Bulletin, 17(2), pp. 248-254.

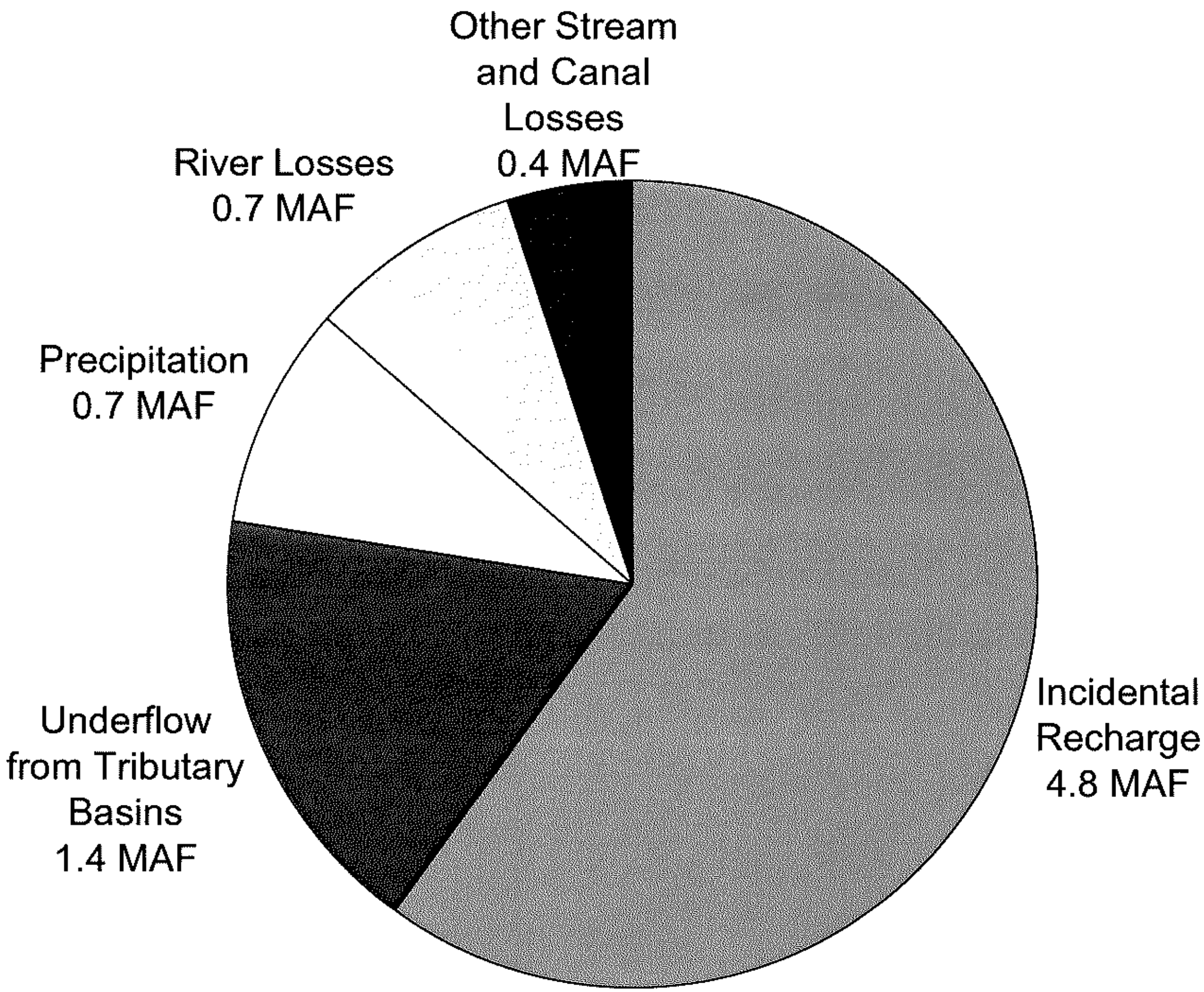
Upper Snake River Basin and ESRP Aquifer



IGWA Exhibit B

Groundwater Budget ESPA Water Year 1980 - RECHARGE

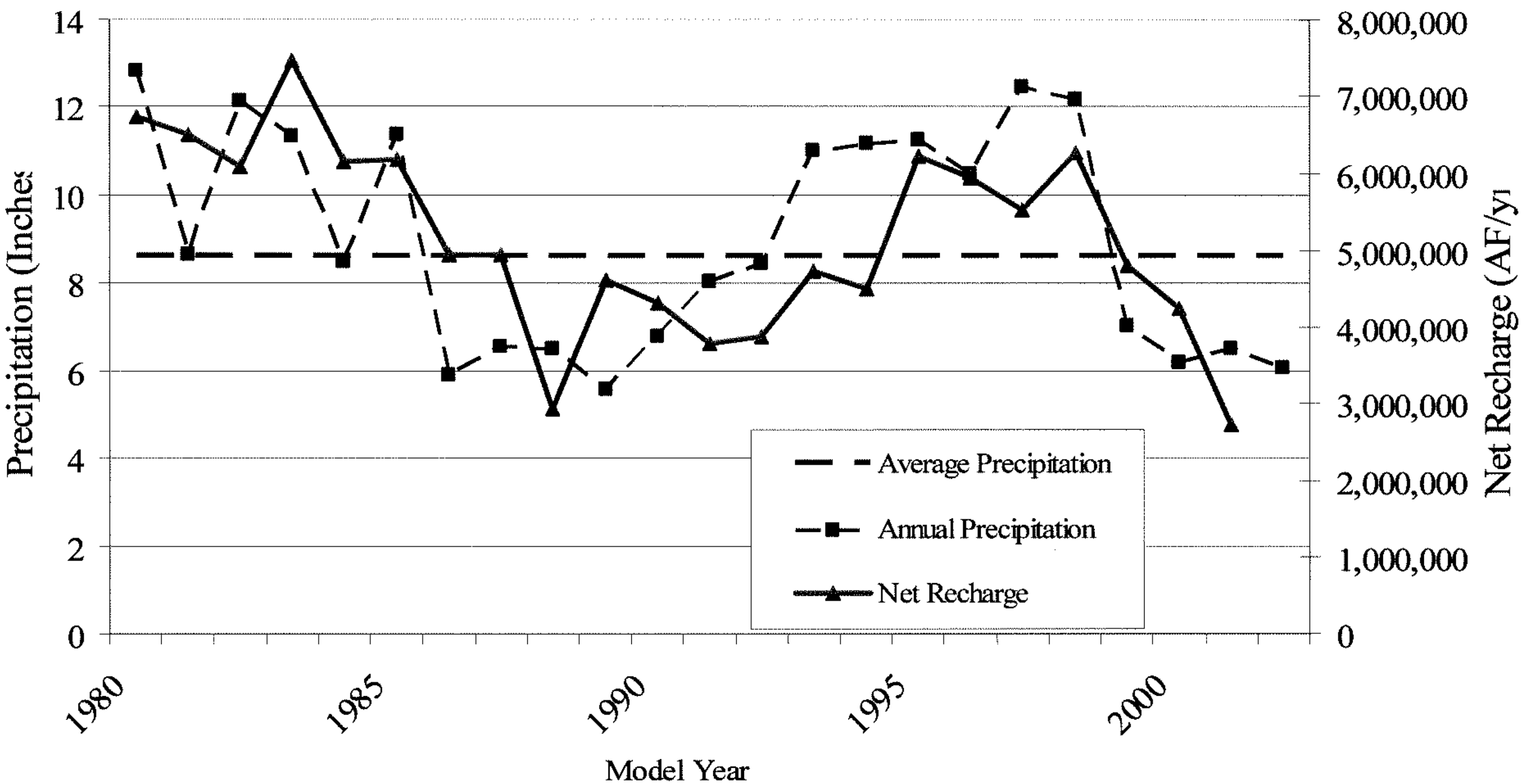
Source: After Lindholm, 1994



IGWA Exhibit C

Net Aquifer Recharge and Precipitation at Aberdeen

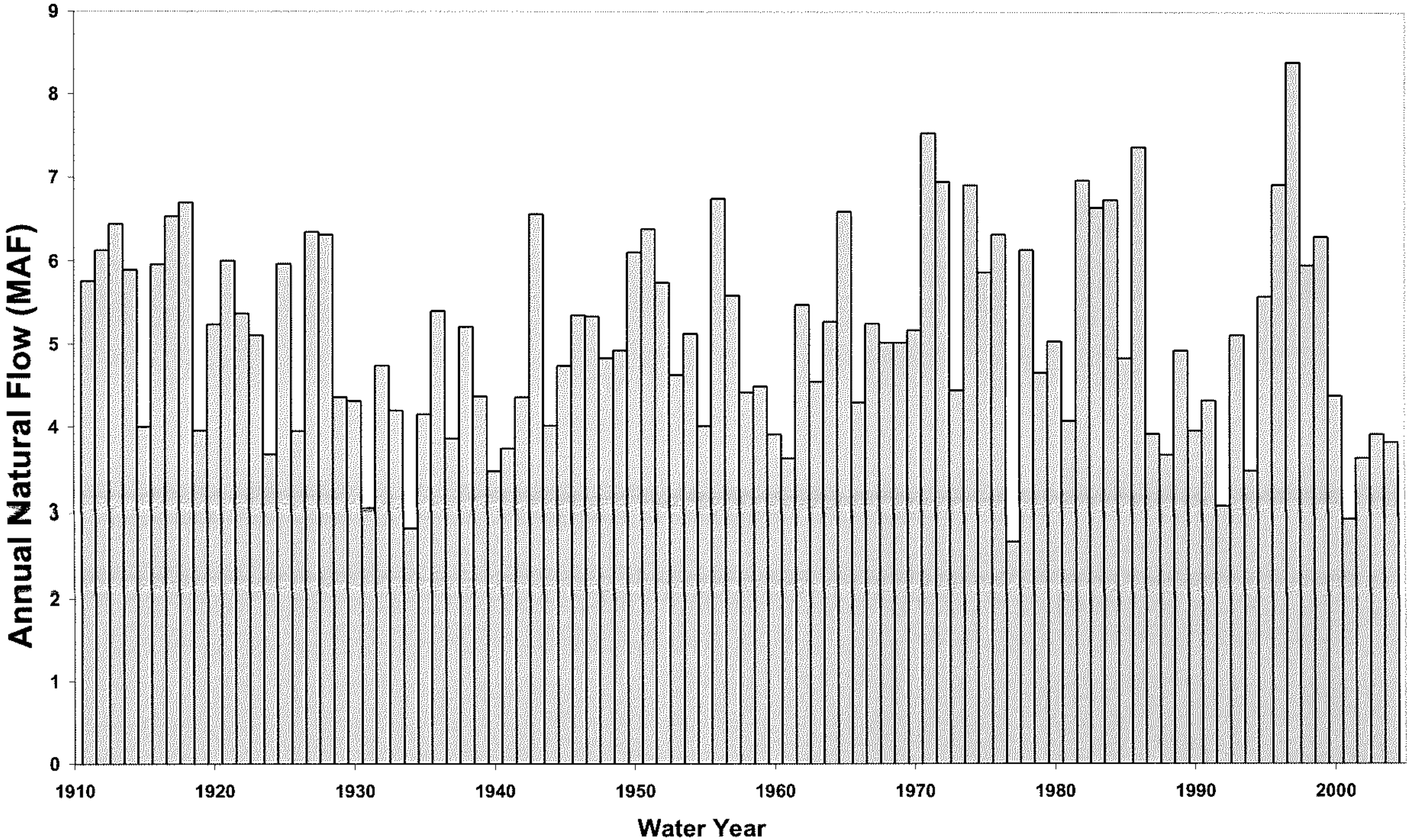
Source: Cosgrove 8-5-04.ppt



IGWA Exhibit D

Annual Natural Flow at Heise

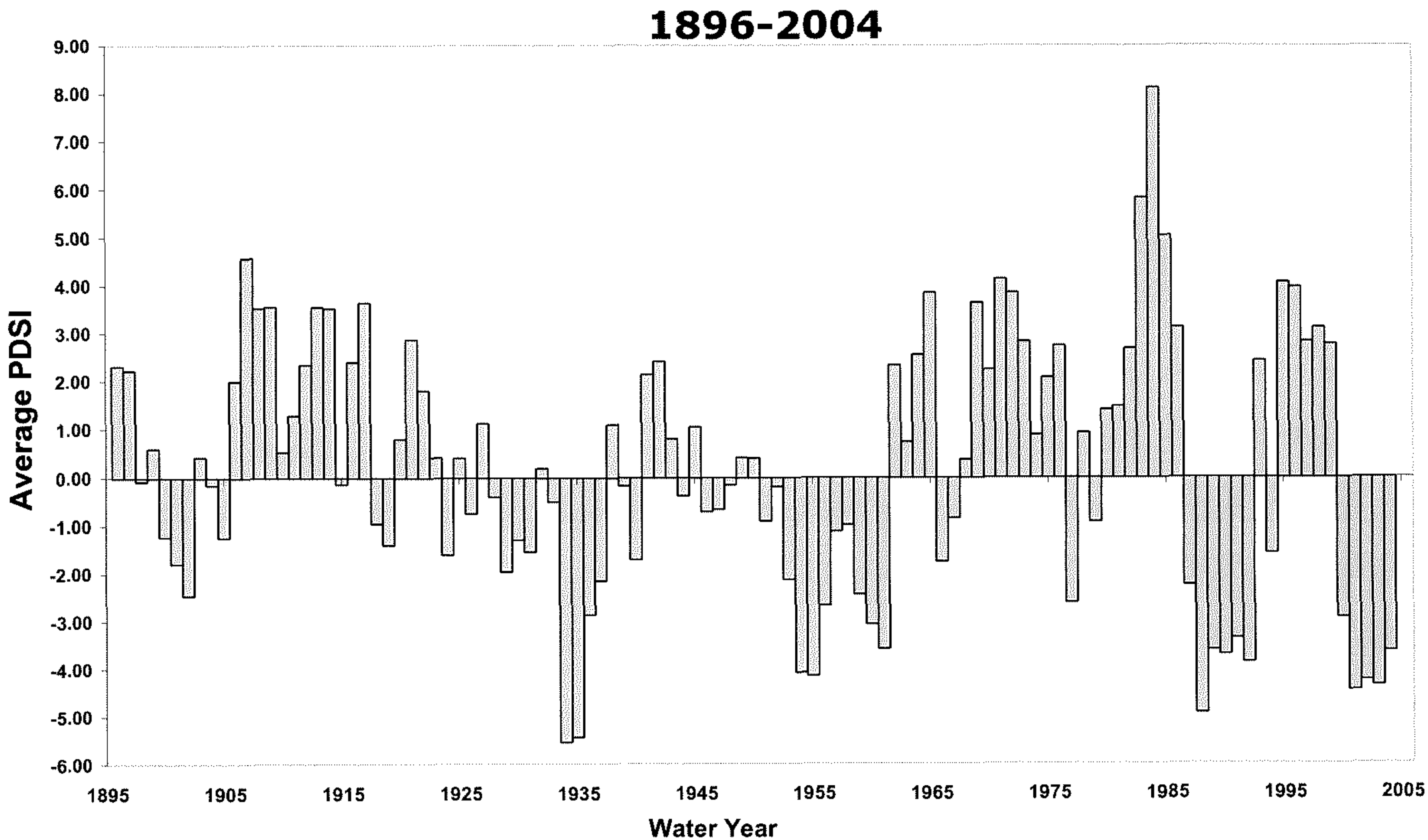
Source: IDWR



IGWA Exhibit E

Palmer Drought Severity Index (PDSI) for Idaho Climate Division #9

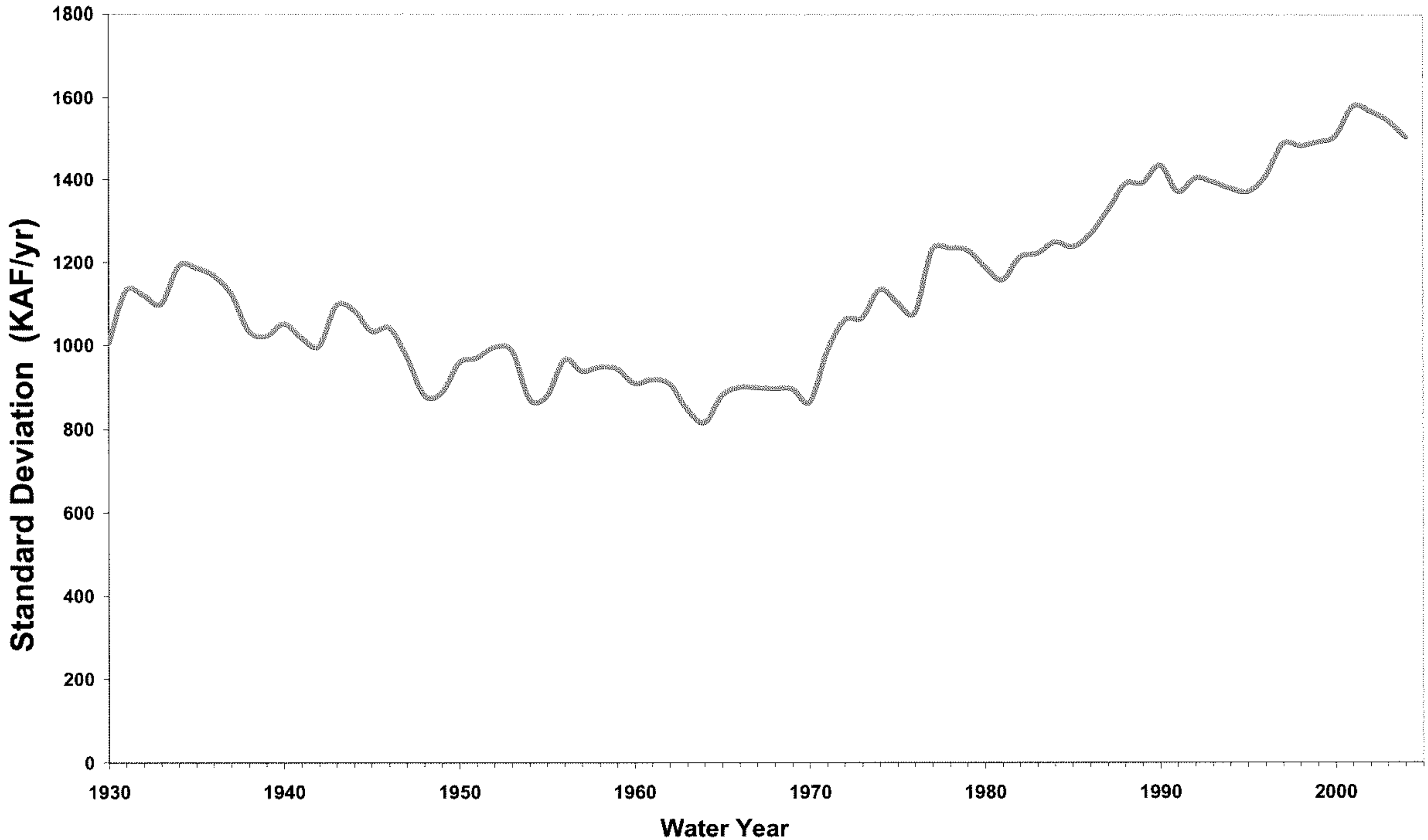
Source: NOAA, 2005



IGWA Exhibit F

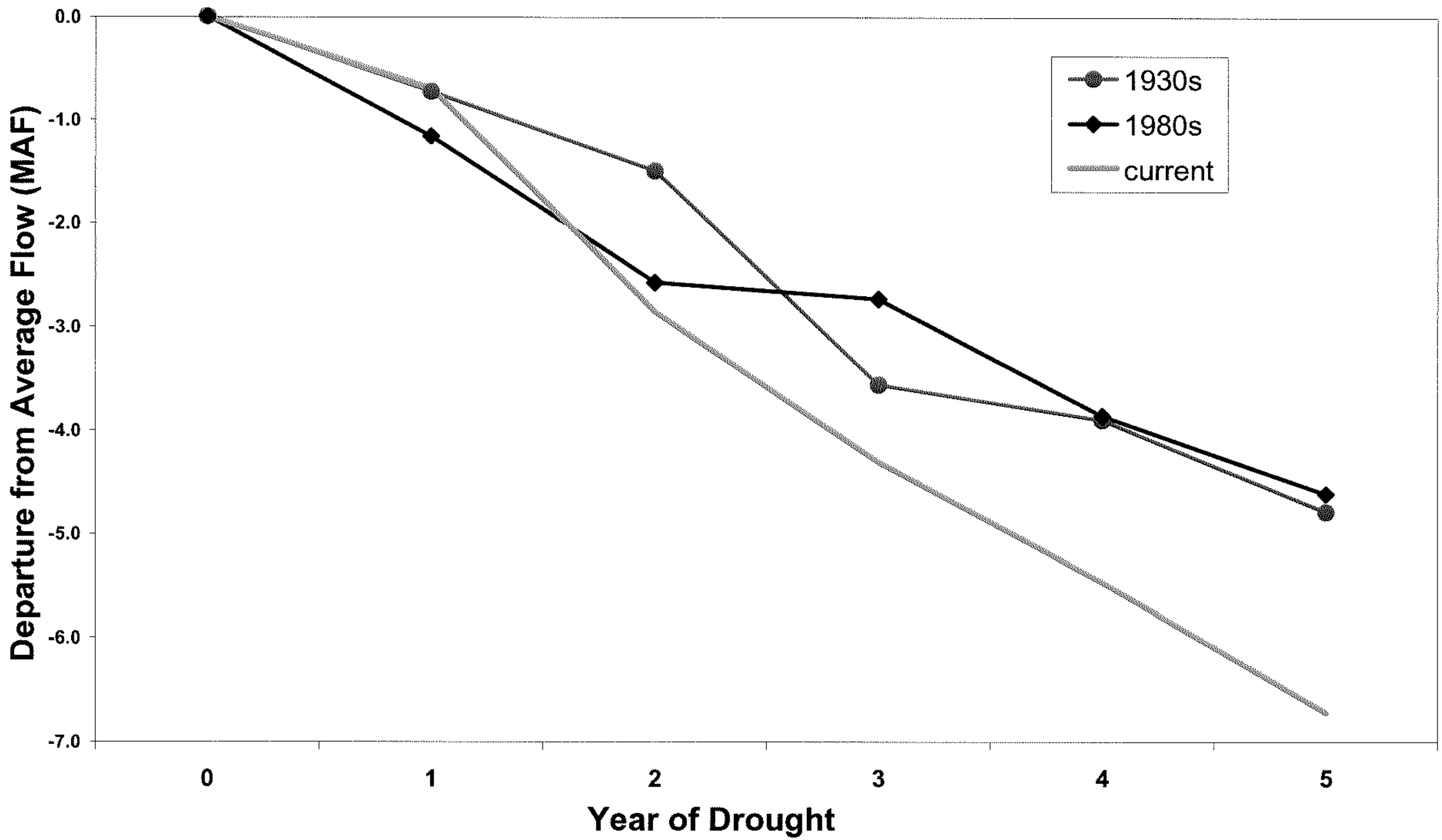
Standard Deviation in Heise Annual Natural Flow (20-yr Moving Window)

Source: IDWR, 2005



IGWA Exhibit G

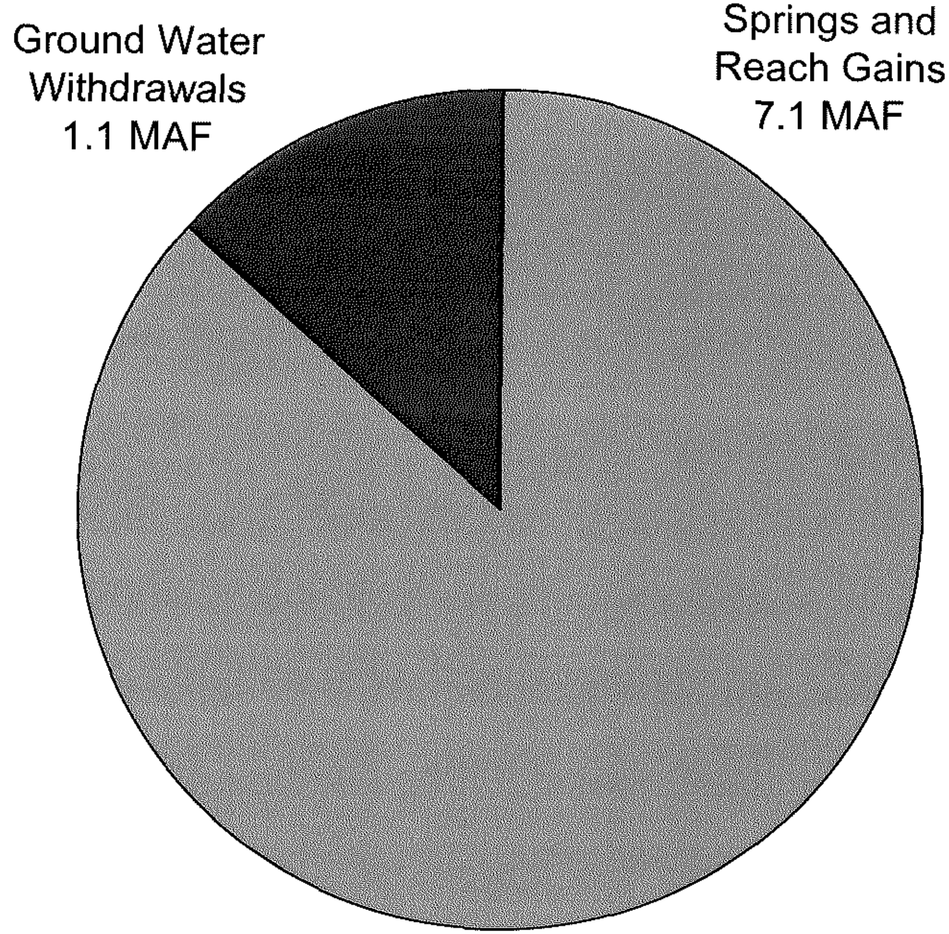
Increasing Drought Deficits for the 1930, 1980, and Current Droughts



IGWA Exhibit H

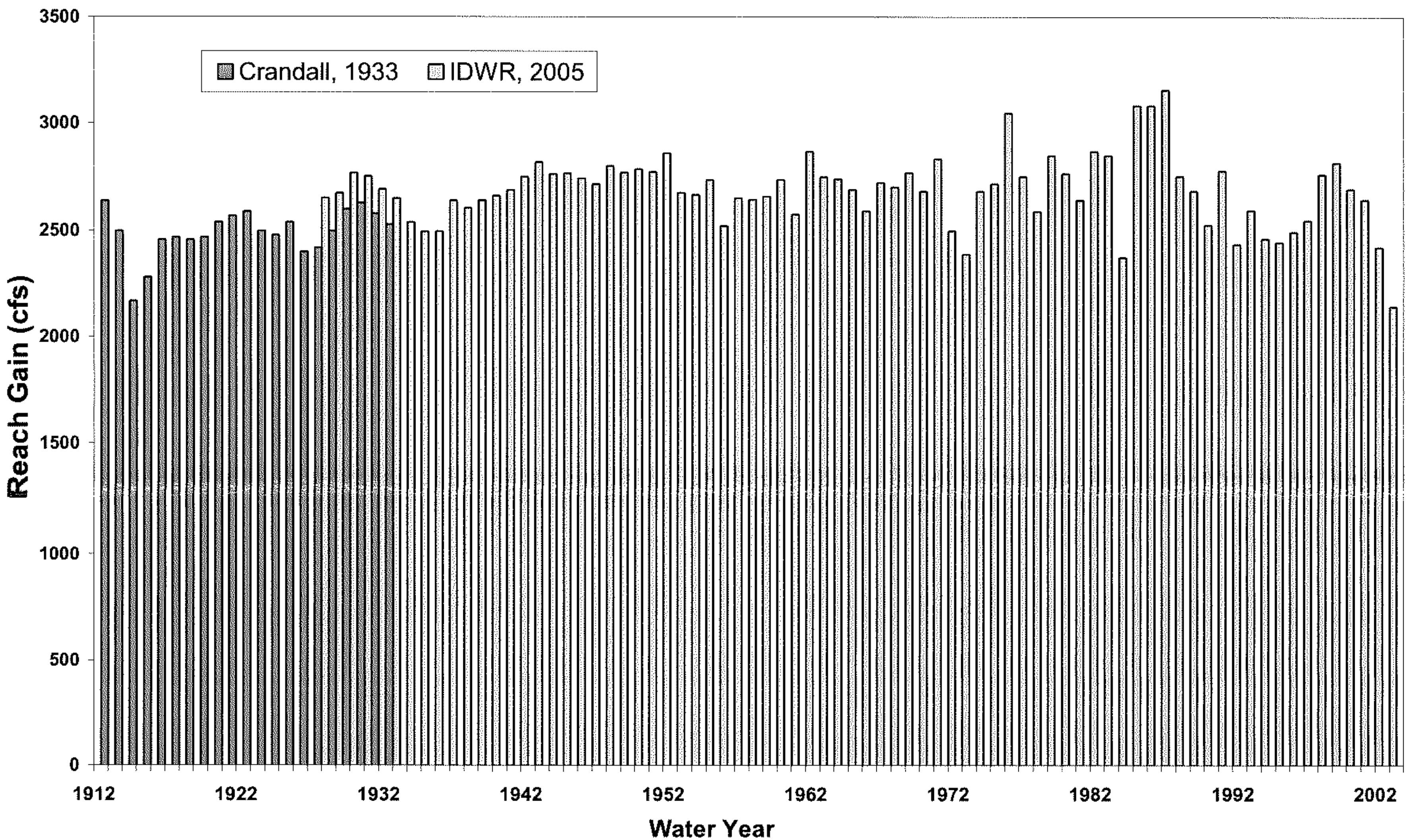
Groundwater Budget ESPA Water Year 1980 - DISCHARGE

Source: After Lindholm, 1994



IGWA Exhibit I

Annual Blackfoot to Neeley Reach Gain

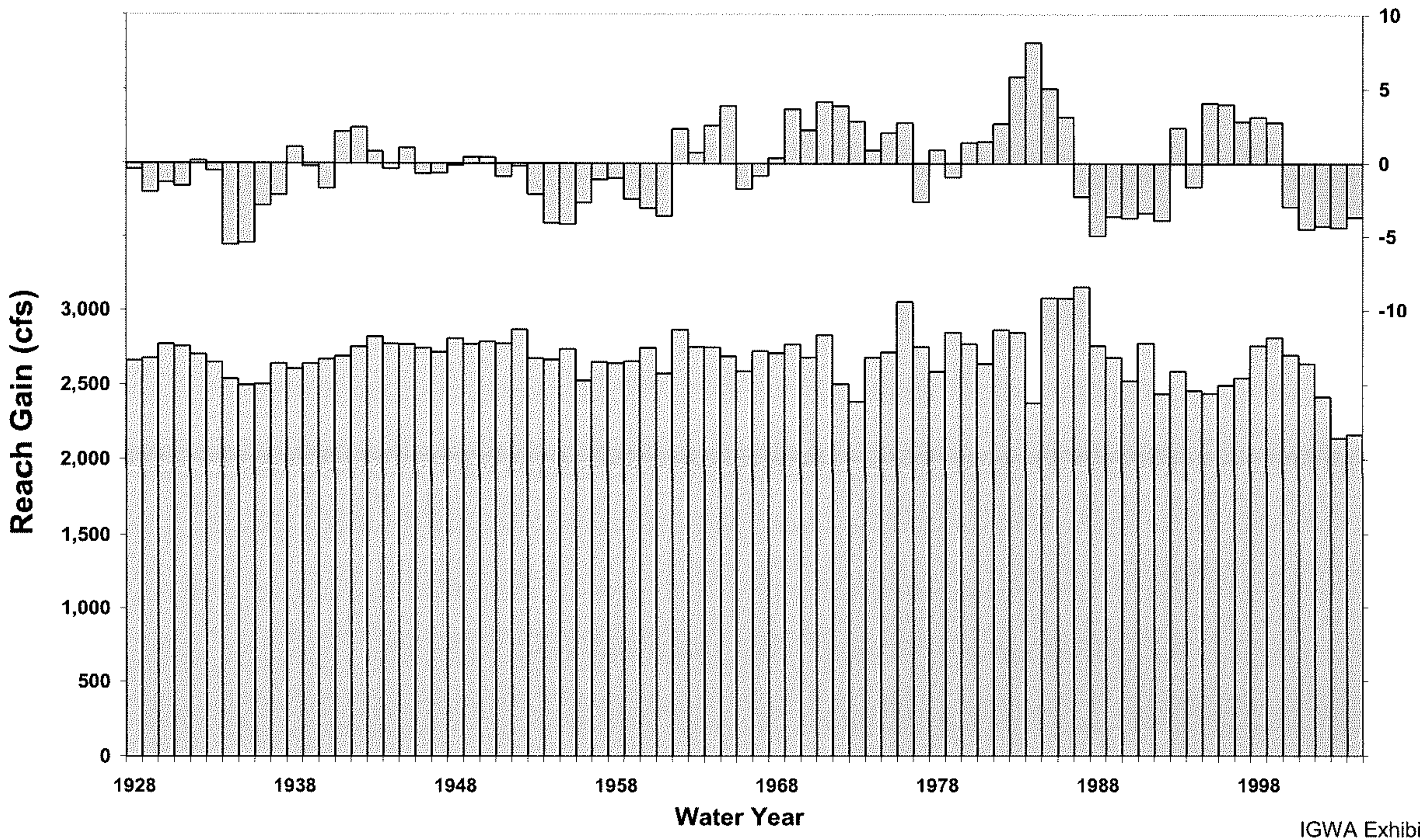


IGWA Exhibit J

Annual Blackfoot to Neeley Reach Gain and PDSI

Source: IDWR, 2005

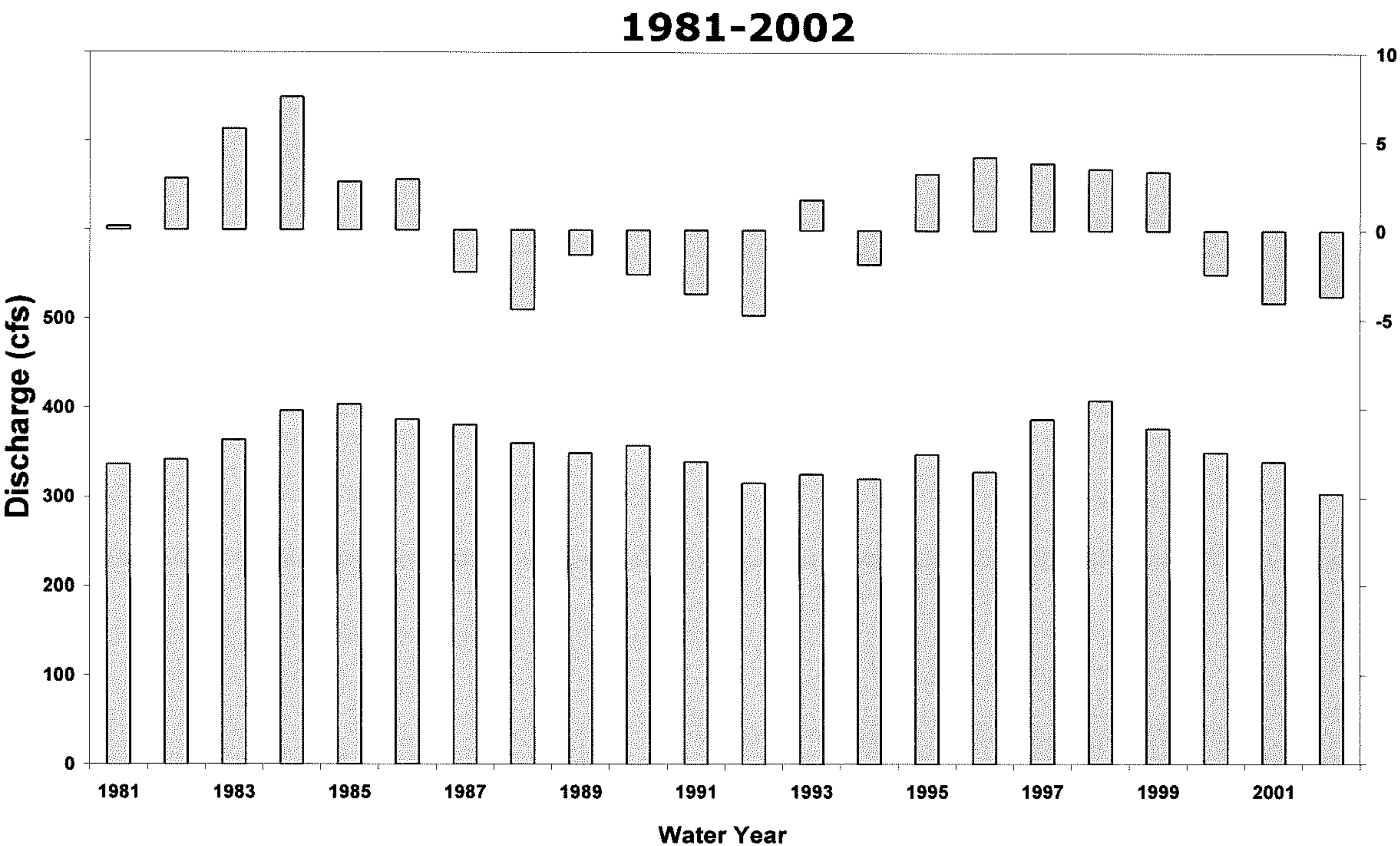
1928-2004



IGWA Exhibit K

Spring Creek Flow and Palmer Drought Severity Index

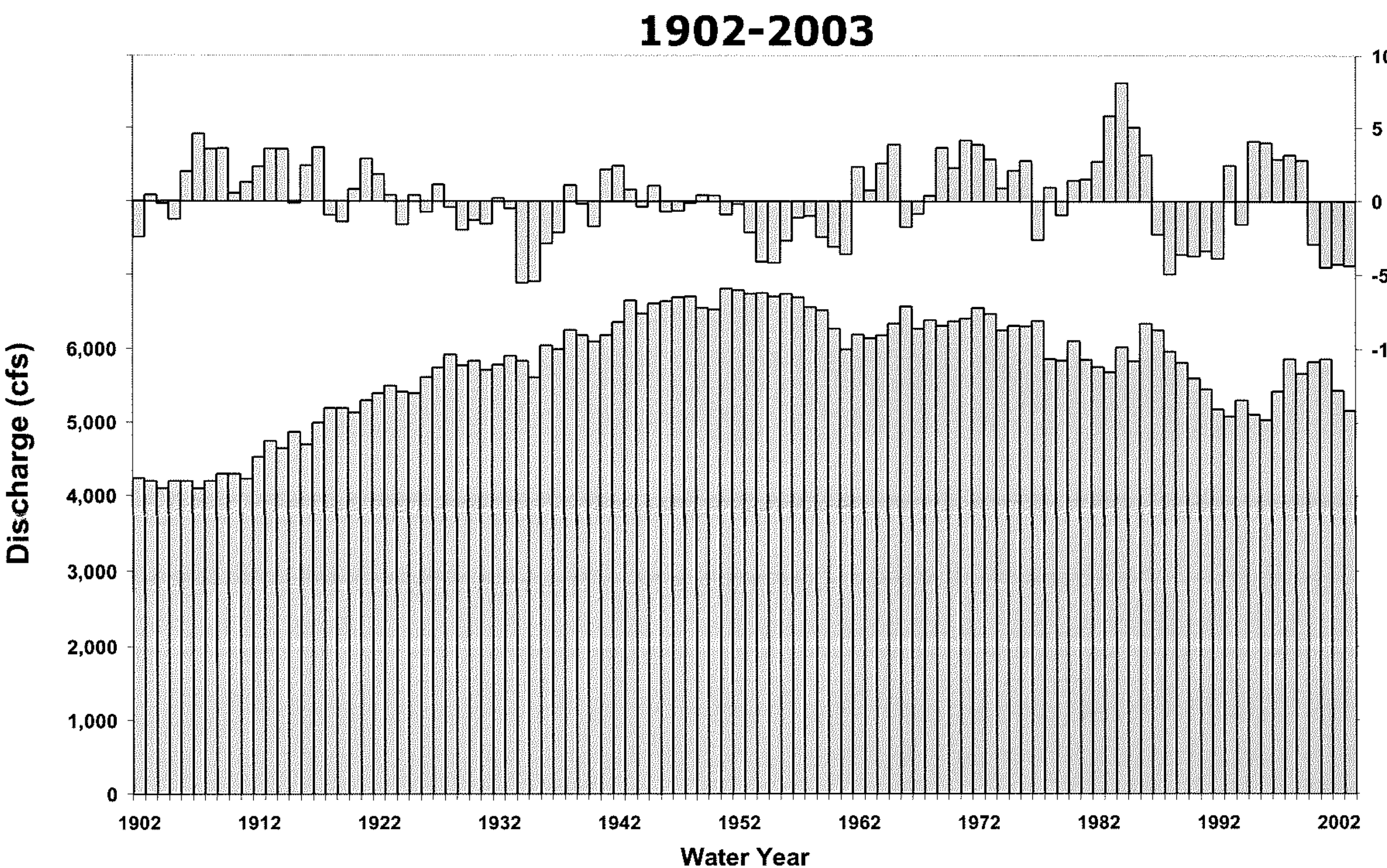
Source: USGS



IGWA Exhibit L

Annual Spring Discharge Btw. Milner and King Hill and PDSI

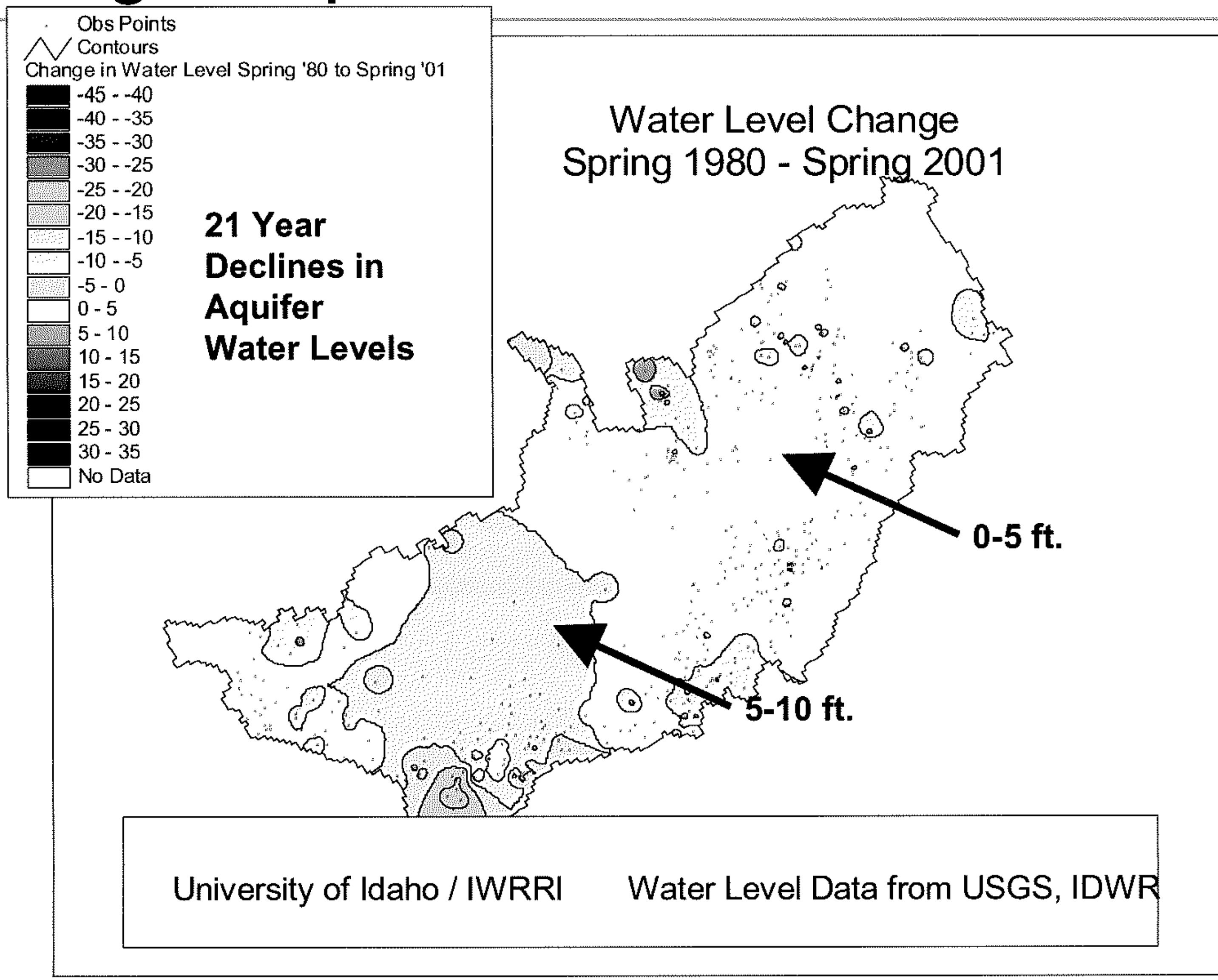
Source: IDWR, 2004



IGWA Exhibit M

Spring 1980 to Spring 2001 Water Level Change Map

Source: Cosgrove 8-5-04.ppt



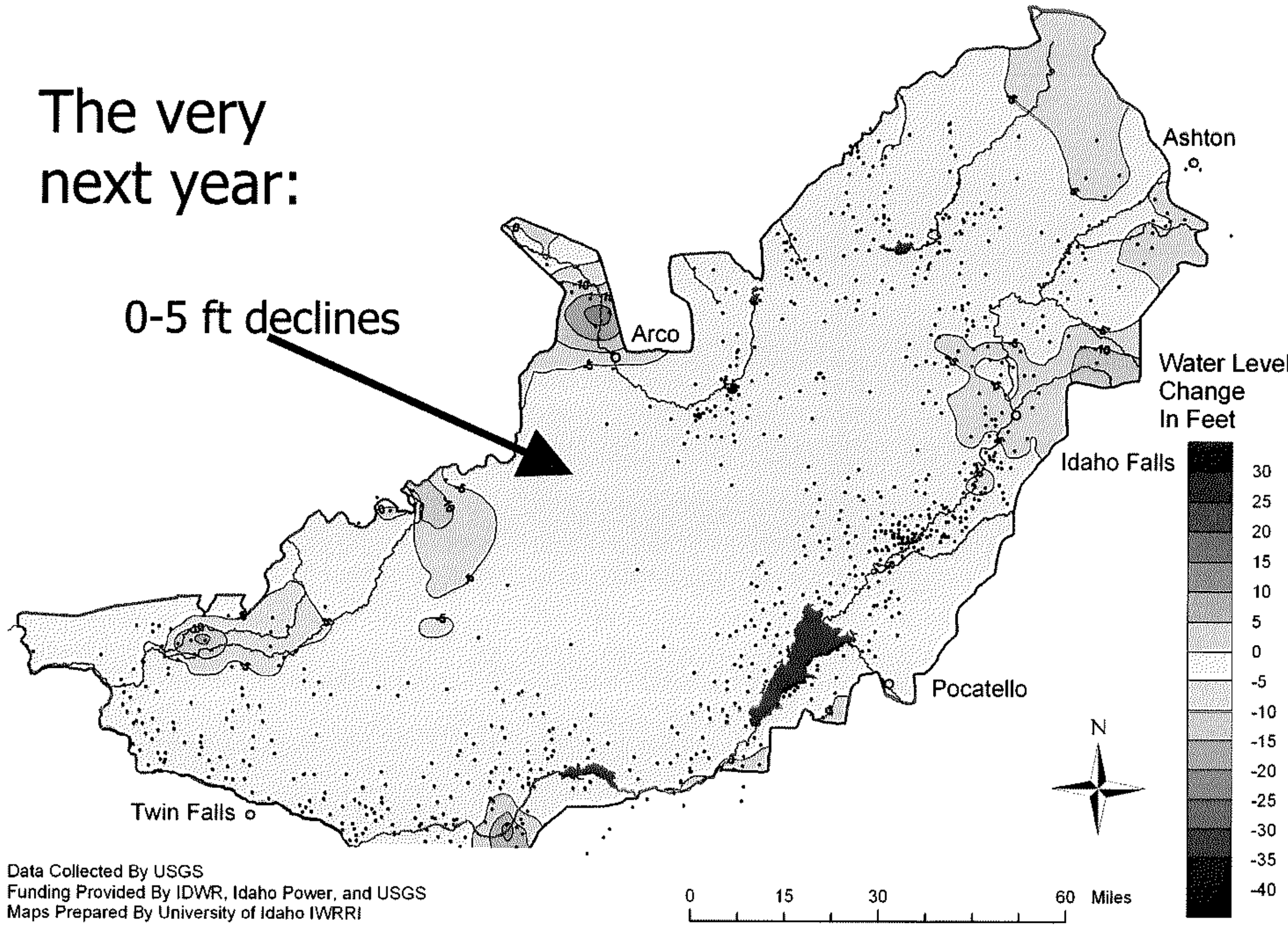
IGWA Exhibit N

Spring 2001 to Spring 2002 Water Level Change Map

Source: Cosgrove 8-5-04.ppt

The very next year:

0-5 ft declines

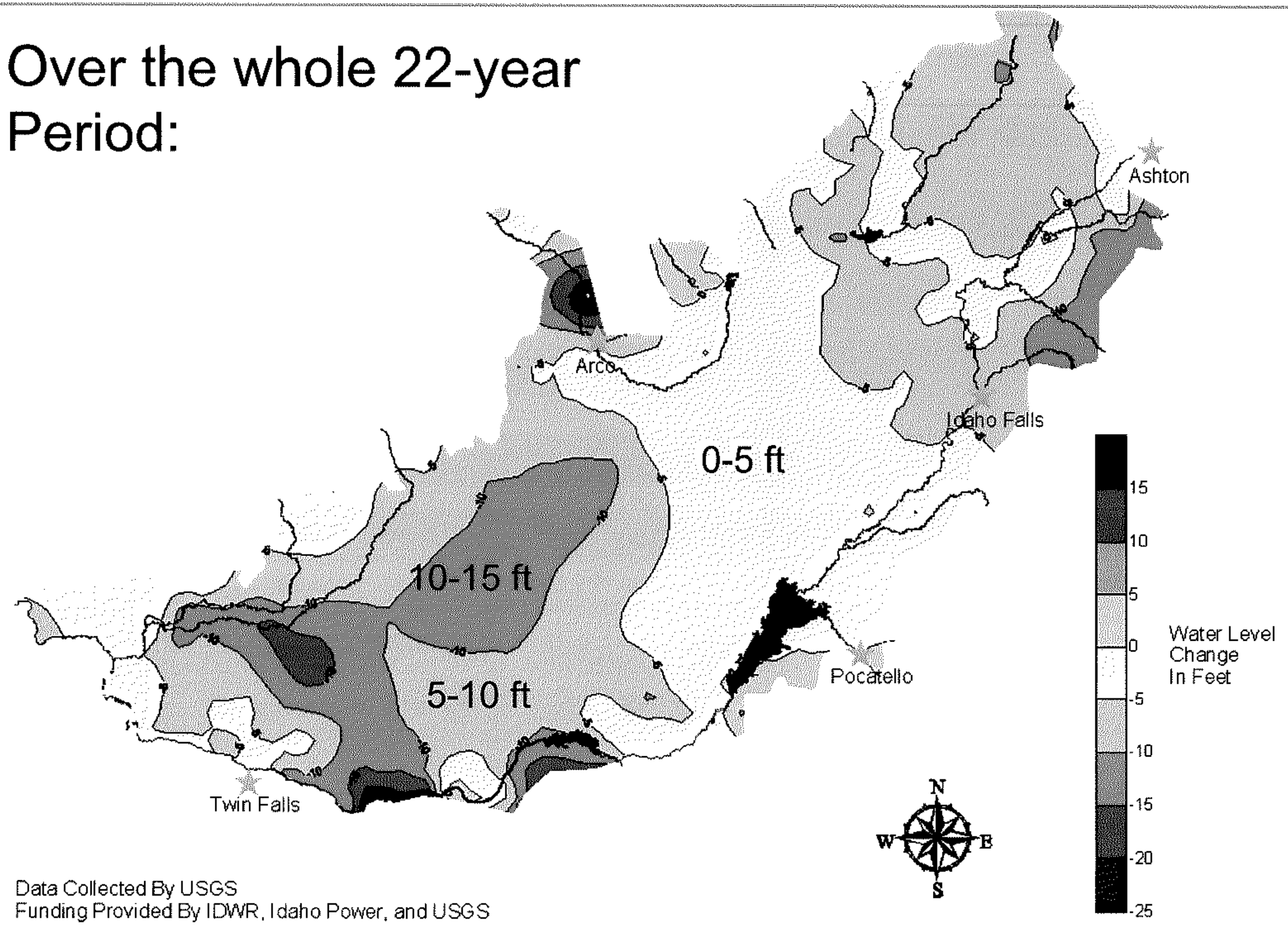


IGWA Exhibit O

Spring 1980 to Spring 2002 Water Level Change Map

Source: Cosgrove 8-5-04.ppt

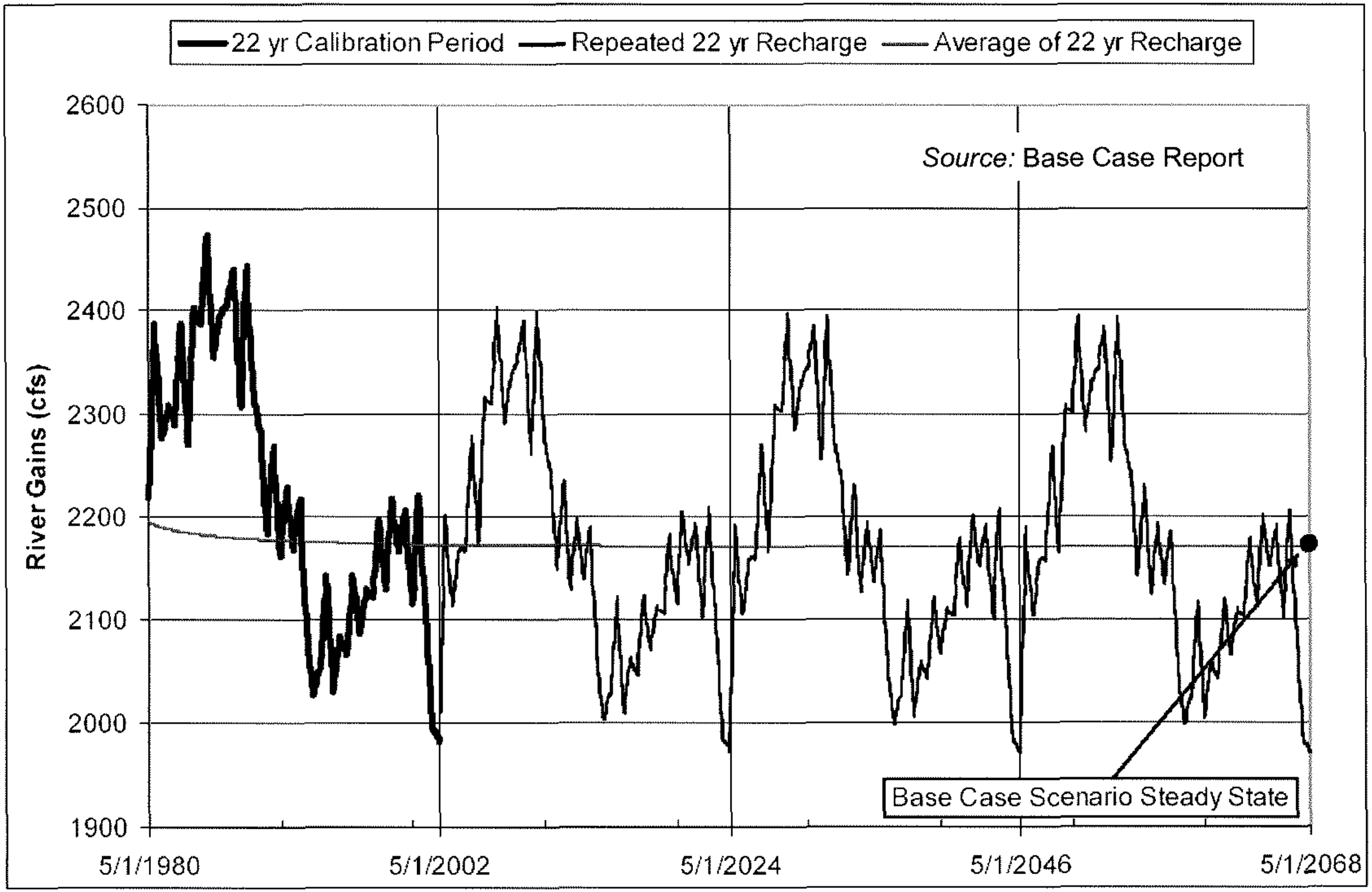
Over the whole 22-year Period:



Data Collected By USGS
Funding Provided By IDWR, Idaho Power, and USGS
Maps Prepared By University of Idaho IWRRI

IGWA Exhibit P

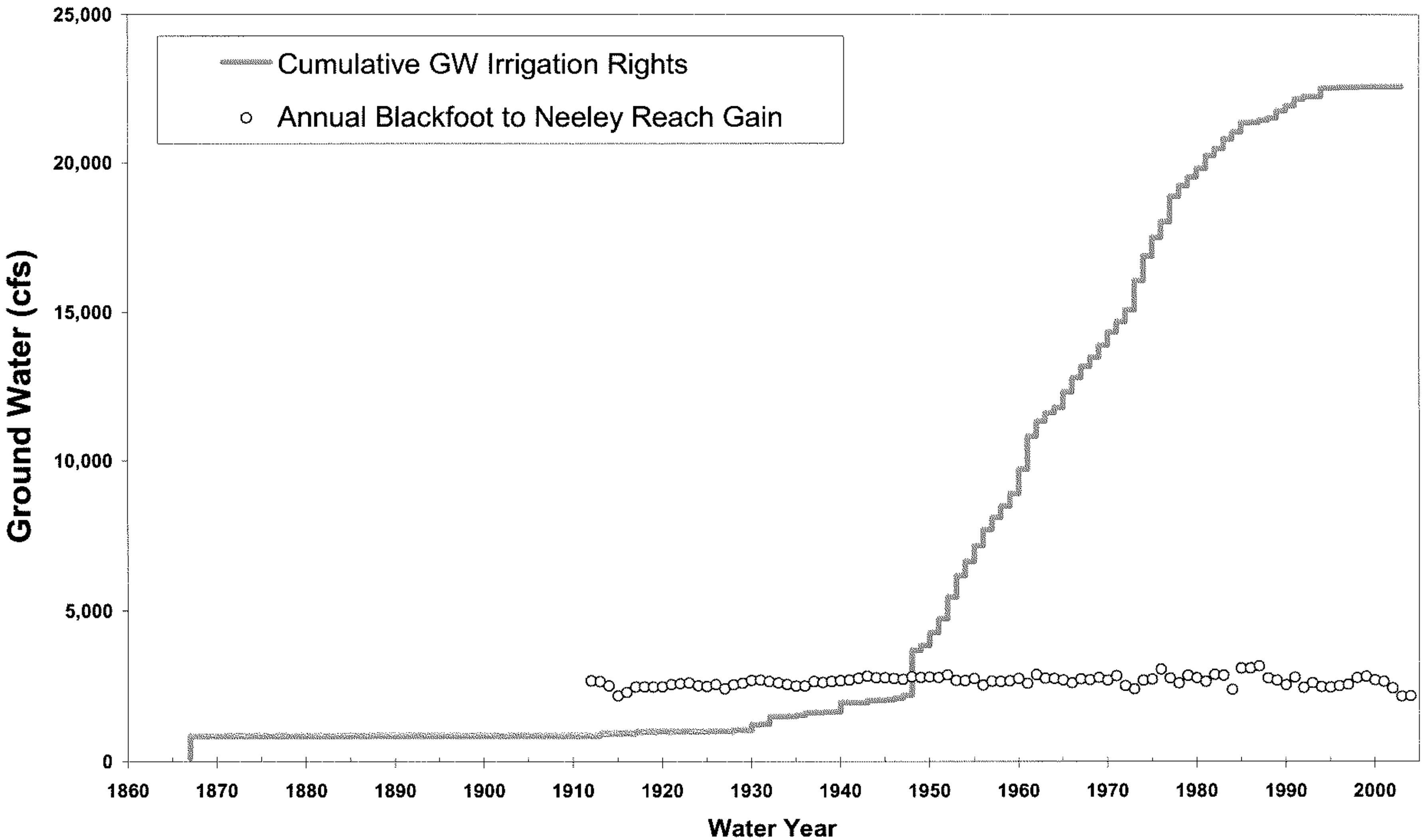
Results of Base Case Scenario
Near Blackfoot to Neeley Reach



IGWA Exhibit Q

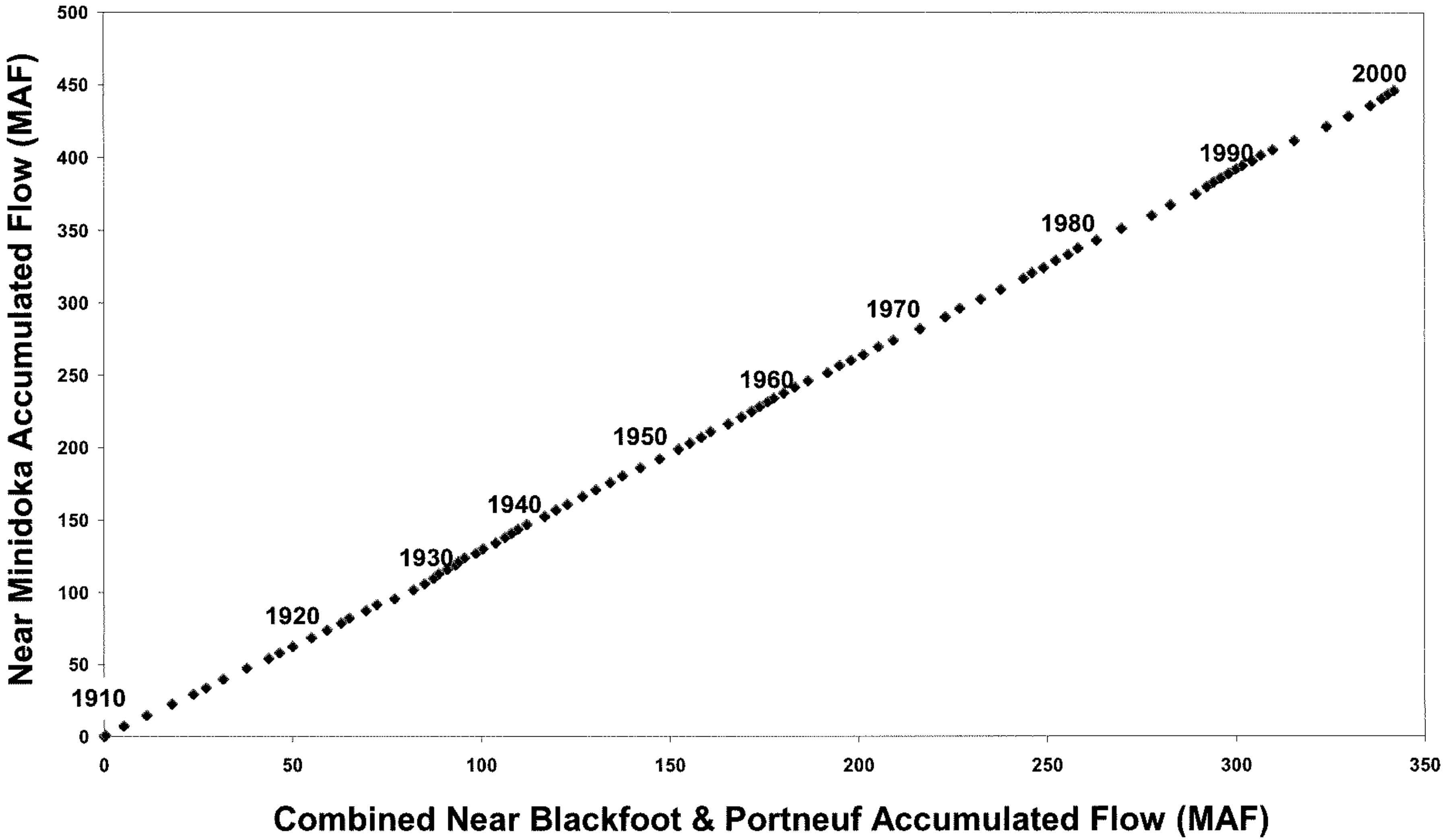
Cumulative Ground Water Irrigation Rights on the ESPA

Source: IWRRI, 2005



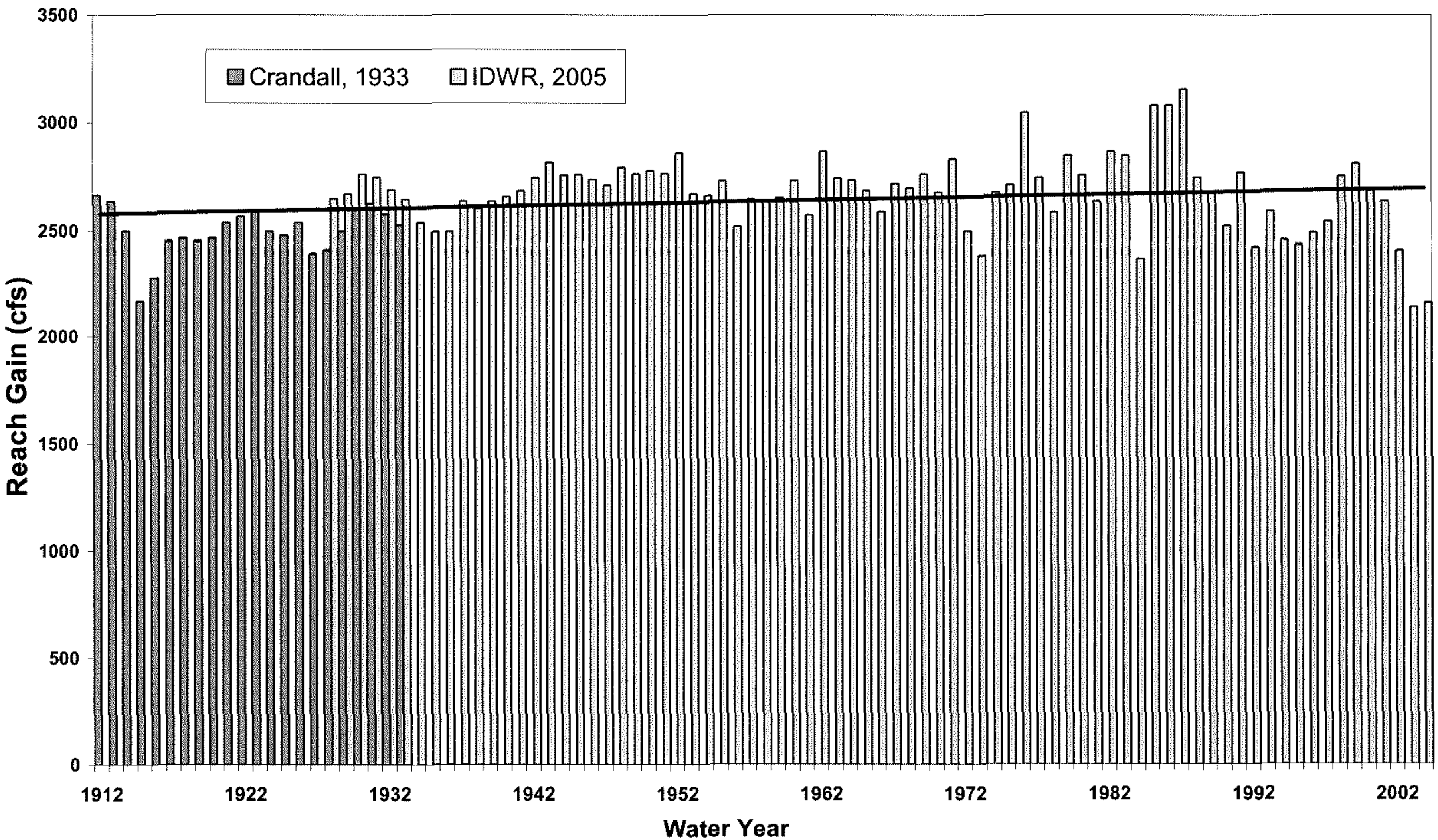
IGWA Exhibit R

Double Mass Analysis: Snake River near Blackfoot & Portneuf vs. near Minidoka



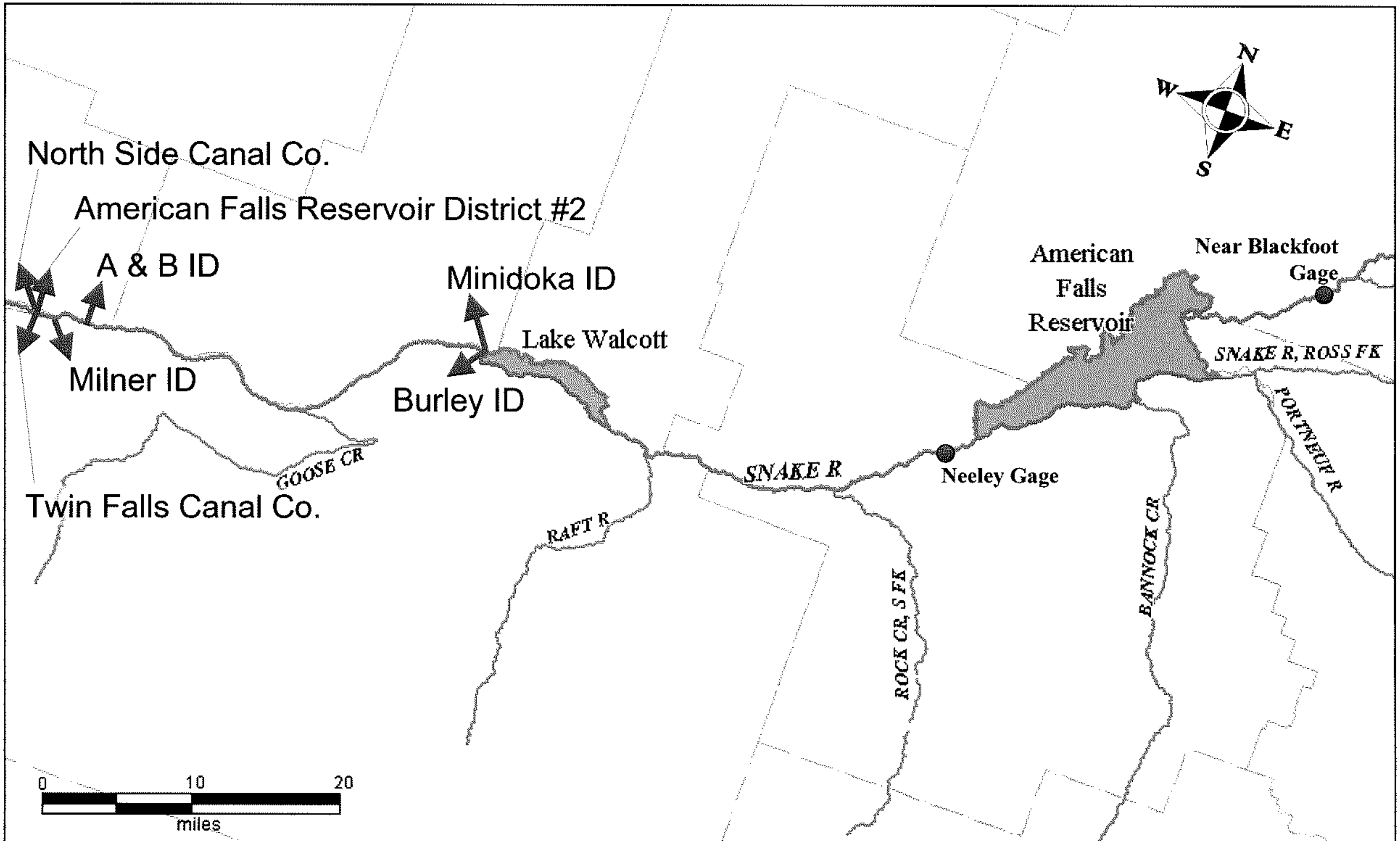
IGWA Exhibit S

Annual Blackfoot to Neeley Reach Gain



IGWA Exhibit T

Blackfoot to Milner Diversions



IGWA Exhibit U

Surface Water Coalition (SWC) Natural Flow Water Rights[1,2]

Canal/District	Priority Date	Amount (cfs)
Minidoka Irrigation District (3)	3/26/1903	1726
	8/6/1908	1000
	4/1/1939	430
		3156
A&B Irrigation District	4/1/1939	267
Milner Irrigation District	11/14/1916	135
	4/1/1939	121
	10/25/1939	37
		293
Am. Falls Res District #2	3/30/1921	850
	4/1/1921	1700
		2550
North Side Canal Company	10/11/1900	400
	10/7/1905	2250
	6/16/1908	350
	12/23/1915	300
	8/6/1920	1260
		4560
Twin Falls Canal Company	10/11/1900	3000
	12/22/1915	600
	4/1/1939	180
		3780

Notes: (1) For irrigation use
(2) From District 1 Watermaster Report for 2000
(3) Water rights shared with Burley Irrigation District

IGWA Exhibit V

Surface Water Coalition (SWC) Storage Water Rights

Mainstem Reservoir Water Rights* and SWC Spaceholder Contracts

Reservoir	Priority Date	Amount (acre-feet)	Spaceholders	Amounts (af)
Jackson Lake	8/23/1906	298,981	Minidoka ID	127,040
	8/18/1910	138,829	Minidoka ID	58,990
			North Side CC	312,007
	5/24/1913	409,190	Twin Falls CC	97,183
		847,000	Others	247,948
			Uncontracted (B.O.R.)	3,832
				847,000
Palisades	03/29/1921**	259,600	Minidoka ID	5,328
	7/28/1939	940,400	Burley ID	2,672
		1,200,000	North Side CC	116,600
			Minidoka ID	29,672
			Burley ID	36,528
			A&B ID	90,800
			Milner ID	44,500
			Others	863,878
			Uncontracted (B.O.R.)	10,022
				1,200,000
American Falls	03/29/1921**	156,830	North Side CC	9,248
	3/31/1921	1,515,760	Twin Falls CC	147,582
		1,672,590	Minidoka ID	82,216
			Burley ID	155,395
			A&B ID	46,826
			Milner ID	44,951
			AFRD#2	393,550
			North Side CC	422,043
			Twin Falls CC	1,165
			Others	360,573
			Uncontracted (B.O.R.)	9,041
				1,672,590
Lake Walcott	12/14/1909	95,200	Minidoka ID	63,308
			Burley ID	31,892
				95,200

* Assuming no space designated as last-to-fill.
** Winter Water Savings Program fill priority is ahead of main reservoir storage right.

IGWA Exhibit W

Surface Water Coalition (SWC) Natural Flow Water Rights[1,2] Sorted by Priority Date

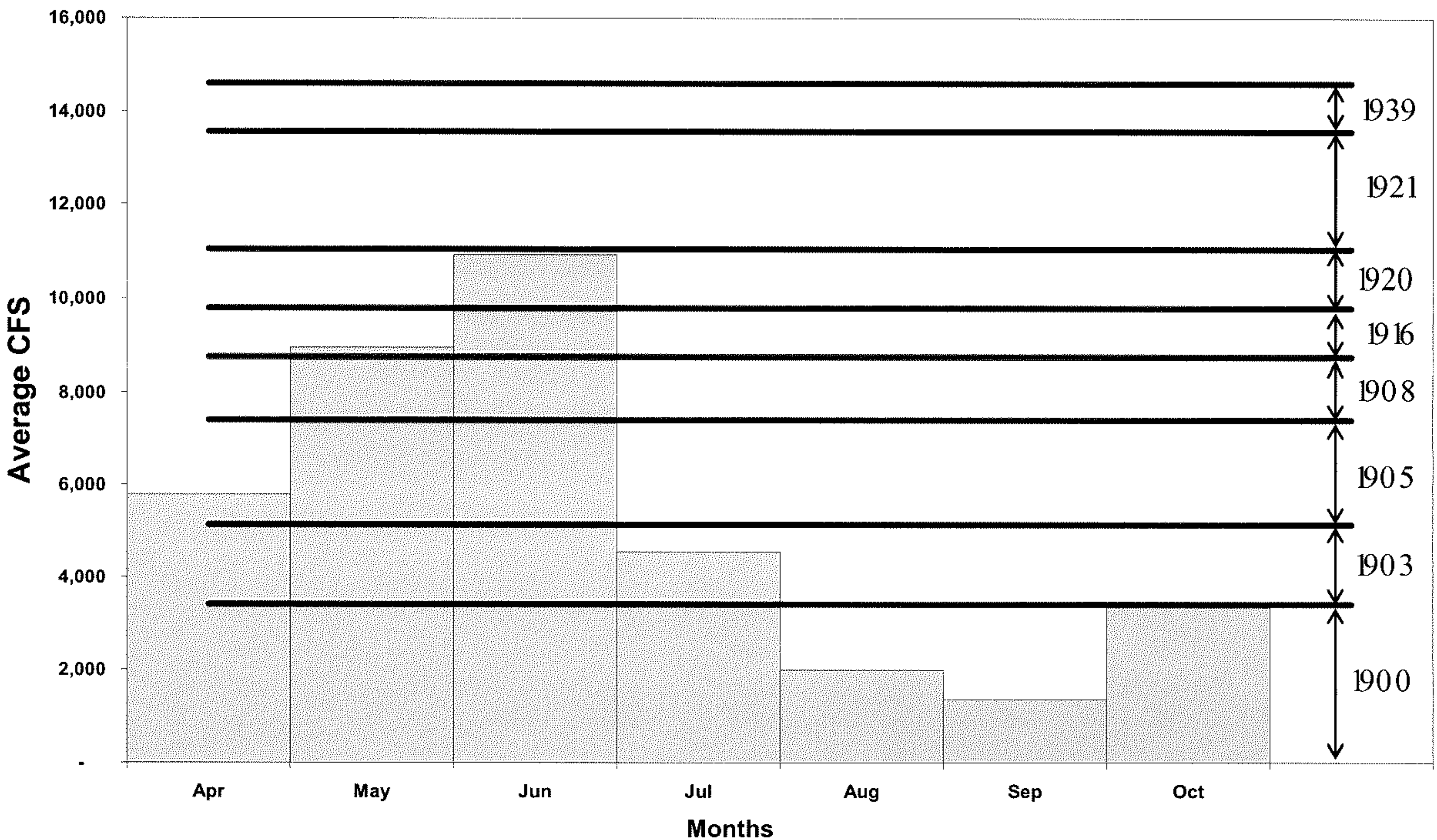
Canal/District	Amount(cfs)	Priority Date	Cumulative Amount (cfs)
North Side Canal Company	400	10 11 1900	400
Twin Falls Canal Company	3000	10 11 1900	3400
Minidoka Irrigation District(3)	1726	3 26 1903	5126
North Side Canal Company	2250	10 7 1905	7376
North Side Canal Company	350	6 16 1908	7726
Minidoka Irrigation District(3)	1000	8 6 1908	8726
Twin Falls Canal Company	600	12 22 1915	9326
North Side Canal Company	300	12 23 1915	9626
Milner Irrigation District	135	11 14 1916	9761
North Side Canal Company	1260	8 6 1920	11021
Am. Falls Res District #2	850	3 30 1921	11871
Am. Falls Res District #2	1700	4 1 1921	13571
Minidoka Irrigation District(3)	430	4 1 1939	14001
A&B Irrigation District	267	4 1 1939	14268
Milner Irrigation District	121	4 1 1939	14389
Twin Falls Canal Company	180	4 1 1939	14569
Milner Irrigation District	37	10 25 1939	14606

Notes: (1) For irrigation use
(2) From District 1 Watermaster Report for 2000
(3) Water rights shared with Burley Irrigation District

IGWA Exhibit X

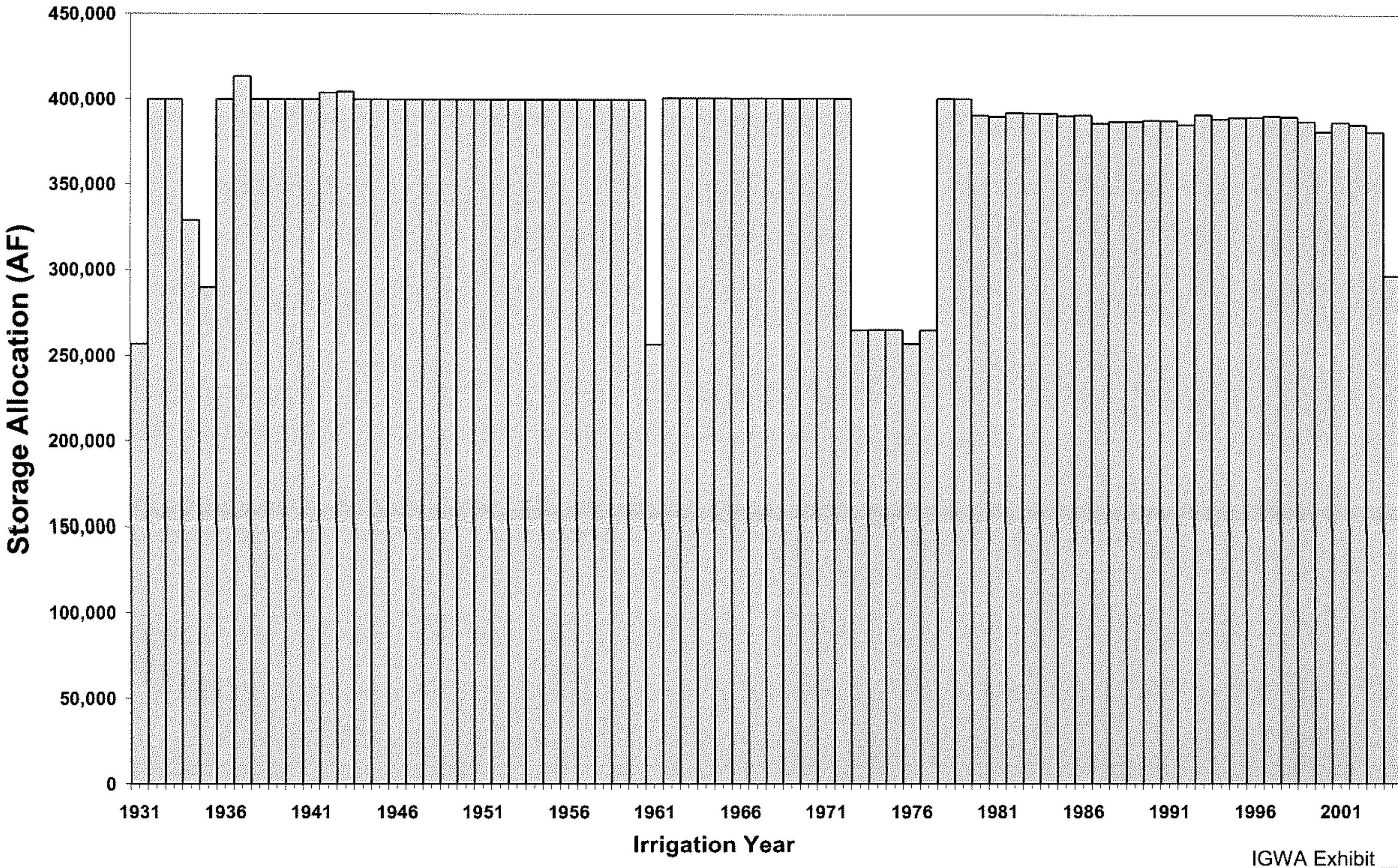
Distribution of 1905 Natural Flow to SWC Water Rights (by year class)

Source: USGS



IGWA Exhibit Y

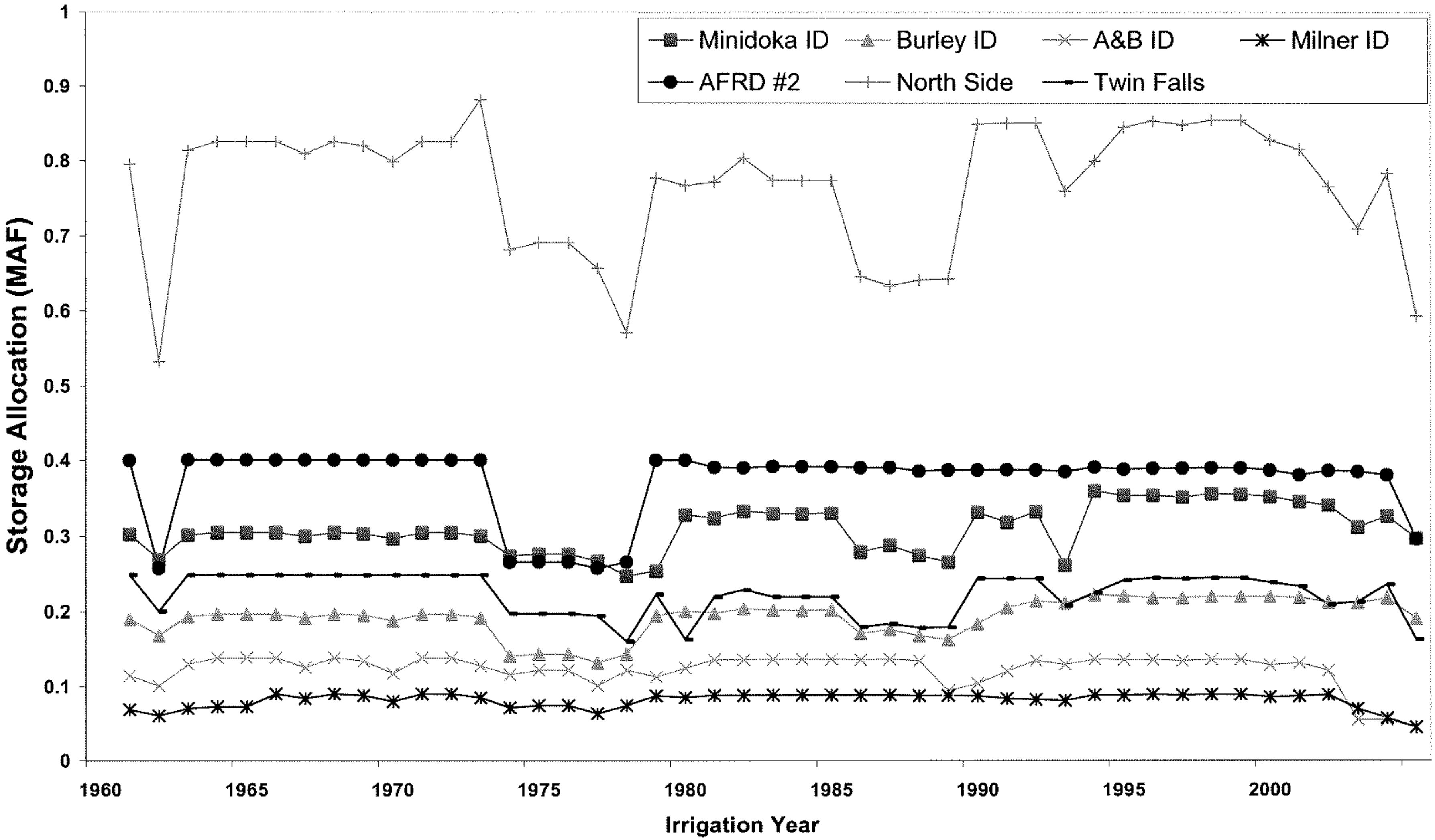
American Falls Reservoir District #2 Initial Storage Allocation



IGWA Exhibit Z

Initial Storage Allocations

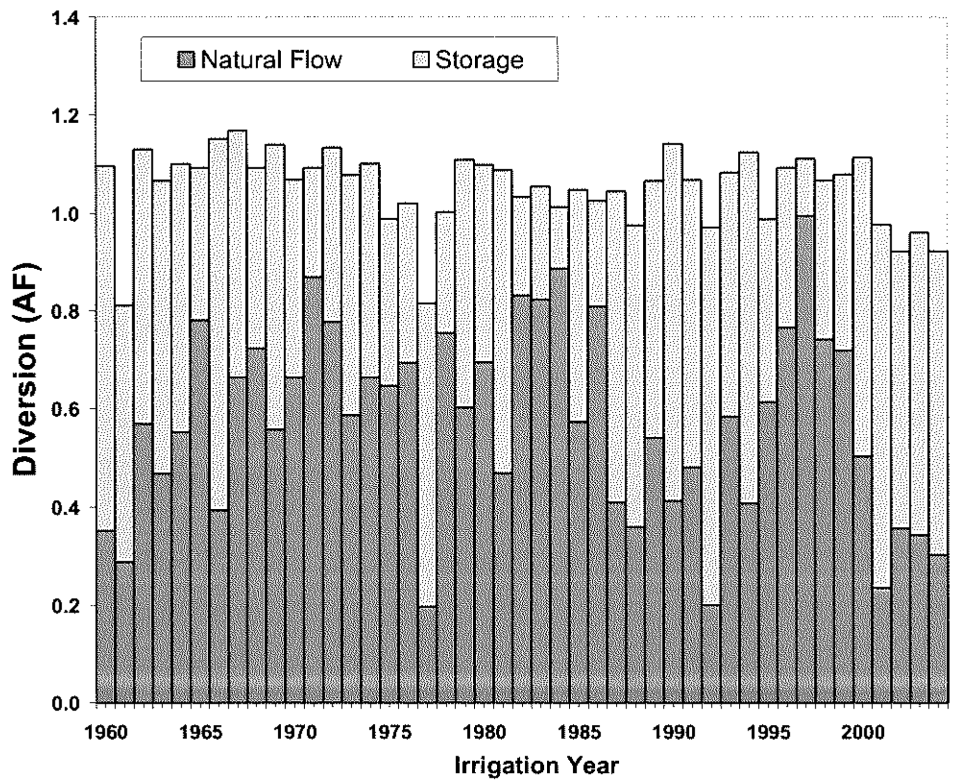
Source: District 1 Accounting

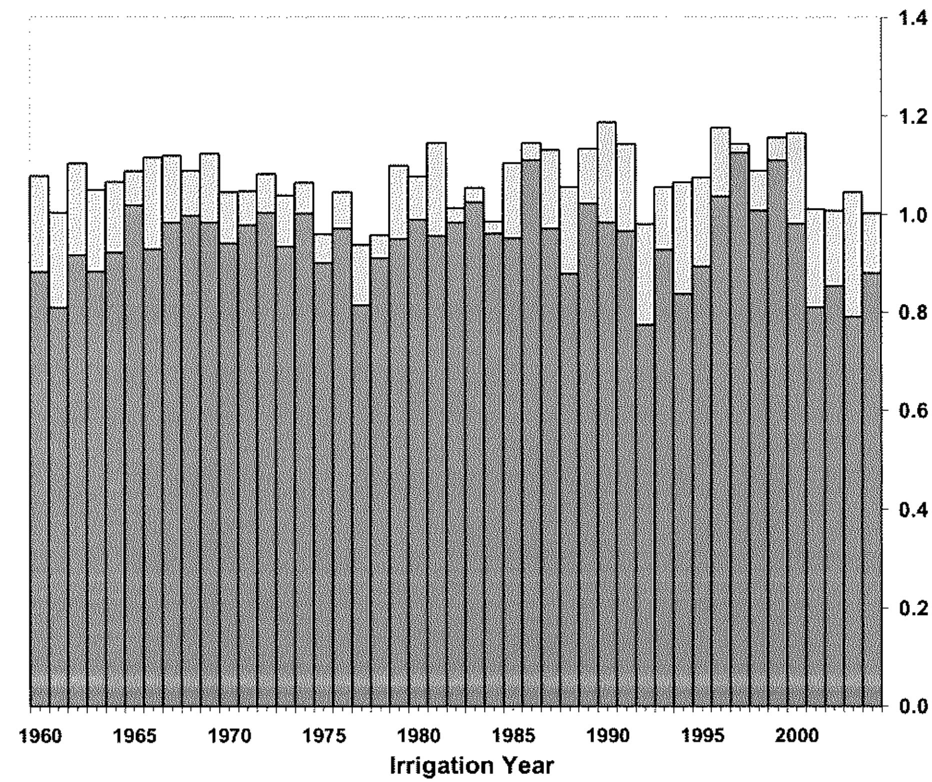


IGWA Exhibit AA

North Side and Twin Falls Canal Company Annual Diversions

Source: District 1 Accounting

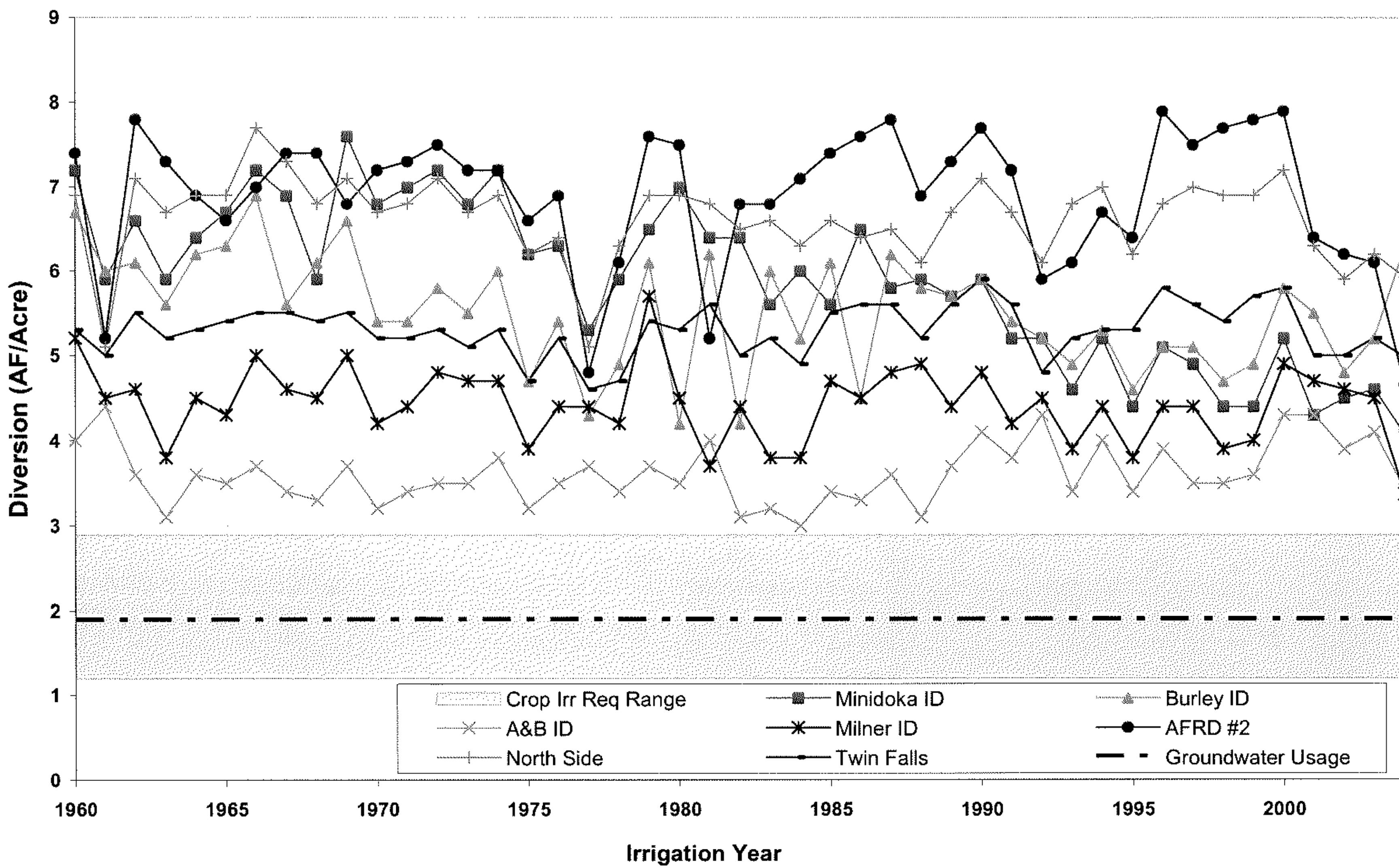




IGWA Exhibit BB

Annual Canal Diversions per Acre

Source: District 1 Accounting



IGWA Exhibit CC

Water Bank Activity

(Acre-Feet)

Consigned to Bank(+), Leased from Bank(-)

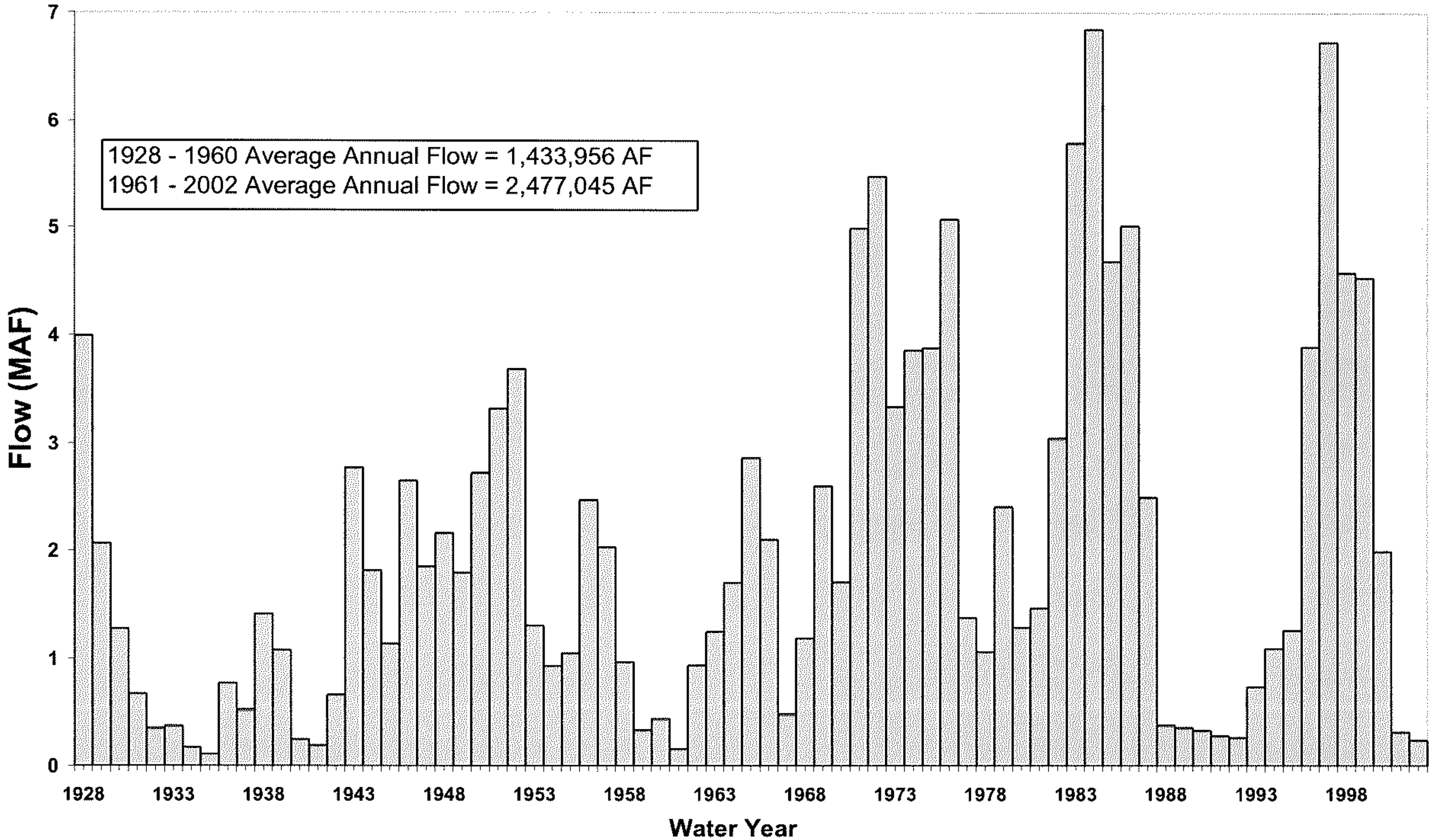
Irrigation Year	Minidoka ID	Burley ID	A&B ID	Milner ID	AFRD #2	North Side	Twin Falls	Total Leased
1960	0	0	0	-10700	0	0	1000	10700
1961	0	0	0	-100	0	0	0	100
1962	0	0	0	-1760	0	0	0	1760
1963	0	0	0	-3560	0	0	0	3560
1964	0	0	0	-1460	0	0	0	1460
1965	0	0	0	-1360	0	0	0	1360
1966	0	0	0	-2660	-48600	0	0	51260
1967	0	0	0	-1360	0	0	0	1360
1968	0	0	0	-1860	0	0	0	1860
1969	0	0	0	0	0	0	0	0
1970	0	0	0	-1320	0	0	0	1320
1971	0	0	0	-820	0	0	0	820
1972	0	0	0	-820	0	0	0	820
1973	0	0	0	0	-56577	0	0	56577
1974	0	0	0	-1450	0	0	0	1450
1975	0	0	0	-1450	0	0	0	1450
1976	0	0	-1450	0	0	0	0	1450
1977	0	0	-43108	0	0	-8346	0	51454
1978	0	0	0	0	0	0	0	0
1979	0	10000	0	0	0	0	60000	0
1980	0	0	0	-1452	0	0	49581	1452
1981	50000	0	50000	-1450	0	0	20000	1700
1982	75000	0	50000	-1500	0	0	50000	1750
1983	150000	0	75000	3500	0	50000	100000	250
1984	350000	0	75000	8500	0	50000	70000	0
1985	95000	0	75000	-1500	0	0	27694	1500
1986	200000	0	0	13500	0	60000	80000	0
1987	90000	0	75000	-2000	0	0	0	2000
1988	90000	0	27000	-2300	0	-32526	0	34826
1989	80000	100000	30000	14077	-225	0	0	225
1990	75000	60000	0	-1359	-1743	0	0	3102
1991	50000	0	0	-7980	-2583	0	0	10563
1992	0	0	0	-494	0	0	0	494
1993	0	0	0	6201	-345	0	0	345
1994	0	-4000	0	-6199	-330	0	-20000	30529
1995	25000	19700	25000	-12207	-225	20000	5000	12432
1996	25000	25183	20000	-9398	-20231	48353	-3757	33386
1997	50000	46472	20000	-6366	0	0	-800	7166
1998	50000	50000	20000	-794	-8404	0	-500	9698
1999	50000	0	20000	-7762	-11133	-446	-500	19841
2000	10000	12000	20000	-1625	-160	0	-4000	5785
2001	0	0	0	0	0	0	0	0
2002	-651	-1738	3000	-1131	-362	-13130	-15189	32201
2003	23777	9136	-17	-2463	-345	-3458	-15071	21354
2004	0	0	0	0	-1202	0	-19228	20430
Avg	34181	7261	12009	-1175	-3388	3788	8538	9773
Min	-651	-4000	-43108	-12207	-56577	-32526	-20000	

Notes:

1. All 2004 data are provisional.
2. Consignments may not include private agreements.
3. Allocation of 2004 late season fill not yet complete, so 2004 consignments are not shown.
4. Water Bank was not formalized until 1980, so data prior may be incomplete

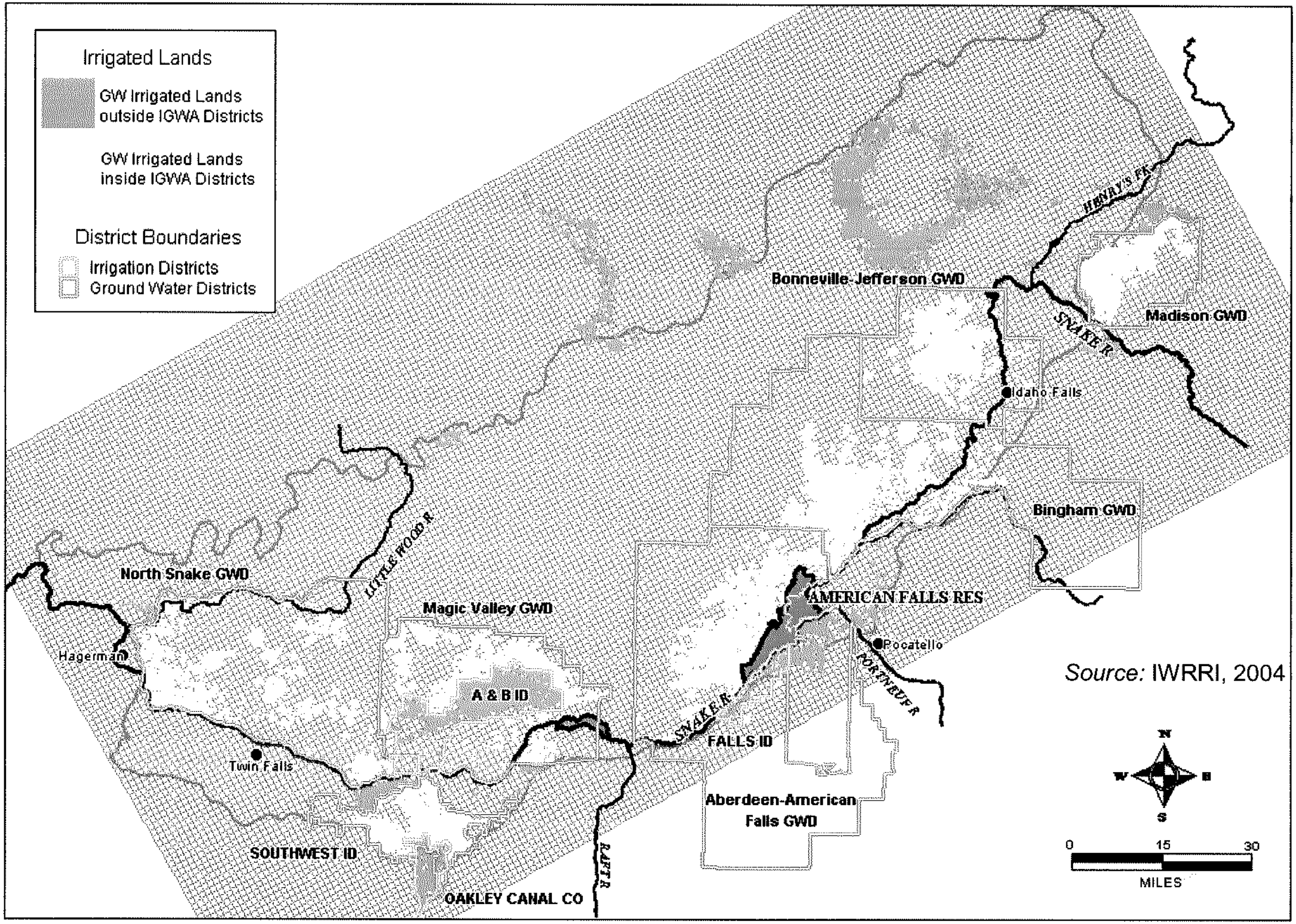
IGWA Exhibit DD

Total Annual Flow Below Milner
(USGS gage 13088000)



IGWA Exhibit EE

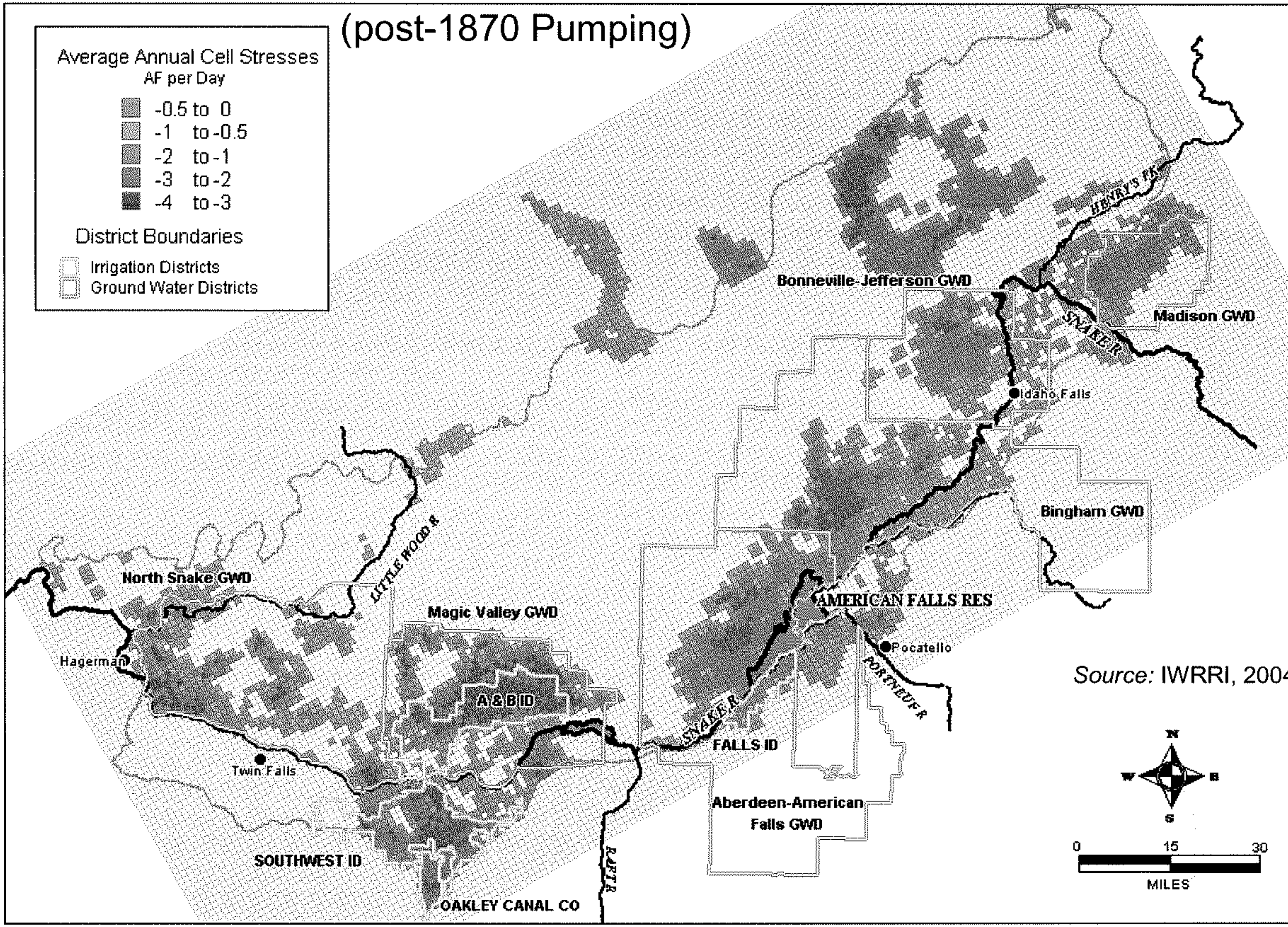
Ground Water Irrigated Lands in the ESPA Model



Source: IWRRI, 2004

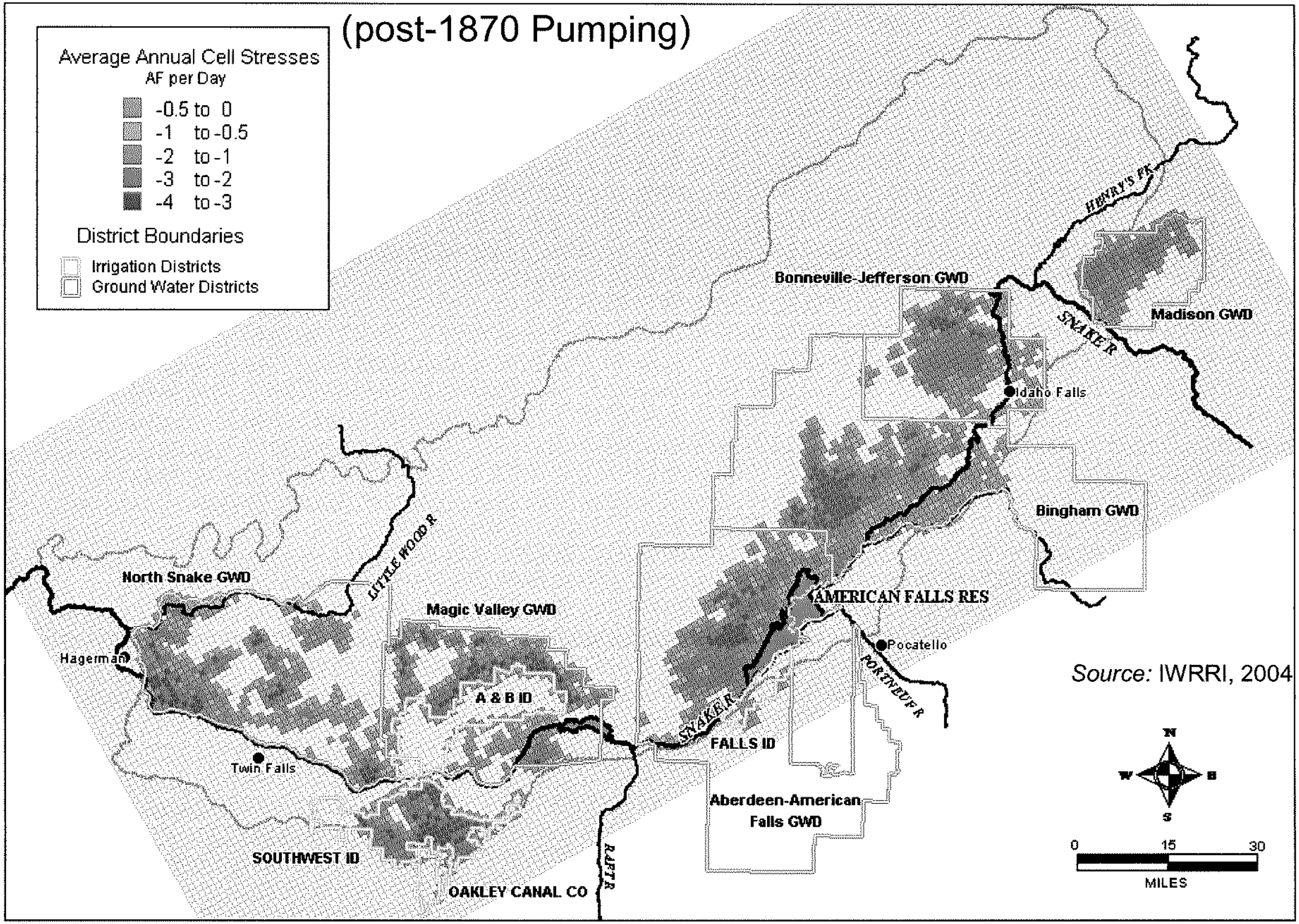
IGWA Exhibit FF

ESPA Model Cell Stresses



IGWA Exhibit GG

ESPA Model Cell Stresses Within IGWA Districts



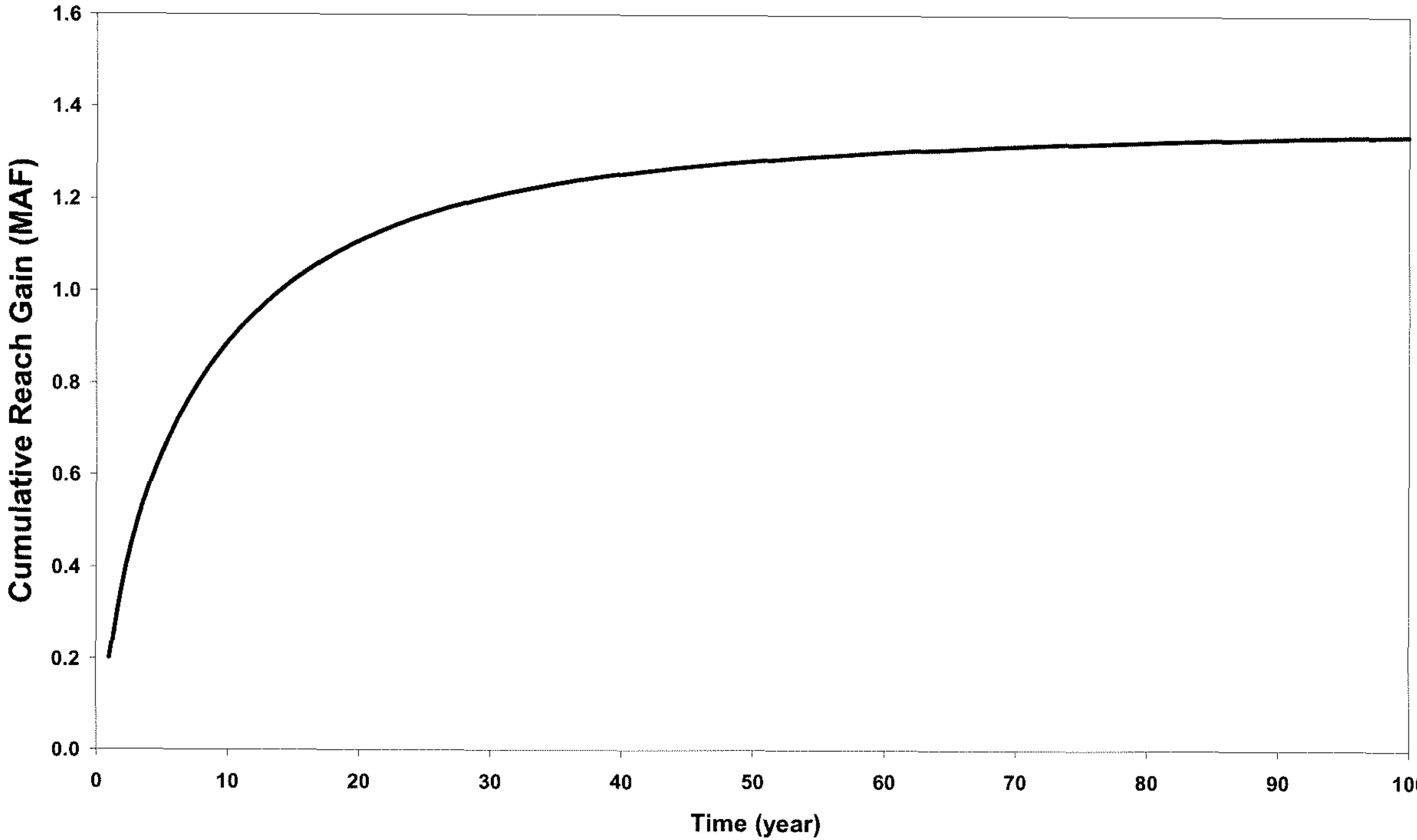
IGWA Exhibit HH

Initial Reach Gains (AF) from 100% Curtailment of Irrigation Pumping

	IGWA Member Districts		All Ground Water Users	
Reach Name	**Irrigation Season**	**First Full Year**	**Irrigation Season**	**First Full Year**
Ashton to Rexburg	3,874	13,206	6,950	24,180
Heise to Shelley	3,784	12,200	6,601	18,563
Shelley to Near Blackfoot	14,875	35,793	16,012	39,408
Near Blackfoot to Neeley	42,468	107,682	54,544	133,725
Neeley to Minidoka	522	1,697	821	2,715
Total	**65,523**	**170,577**	**84,928**	**218,591**

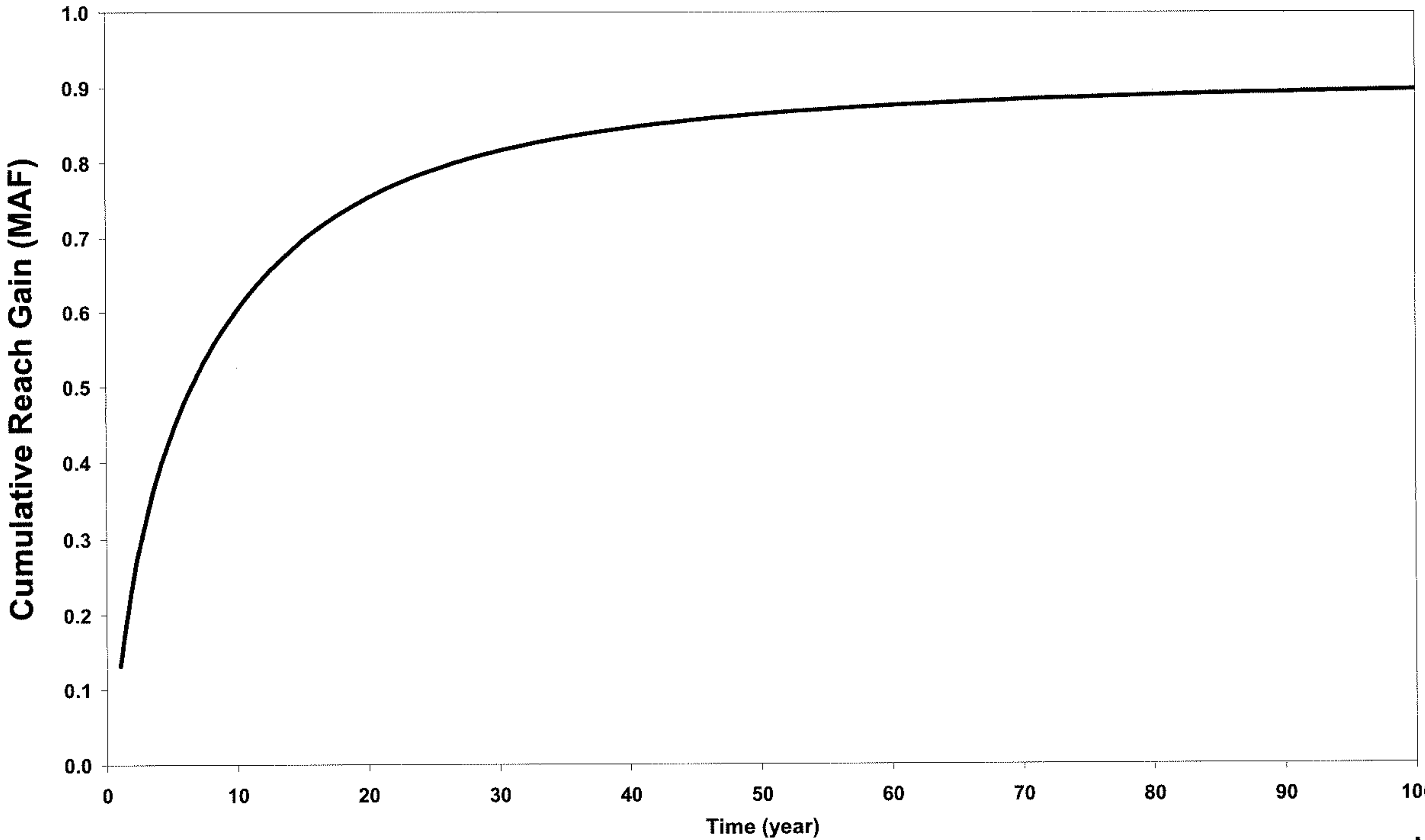
IGWA Exhibit II

Transient Increase in Reach Gains above Milner, 1949 Curtailment



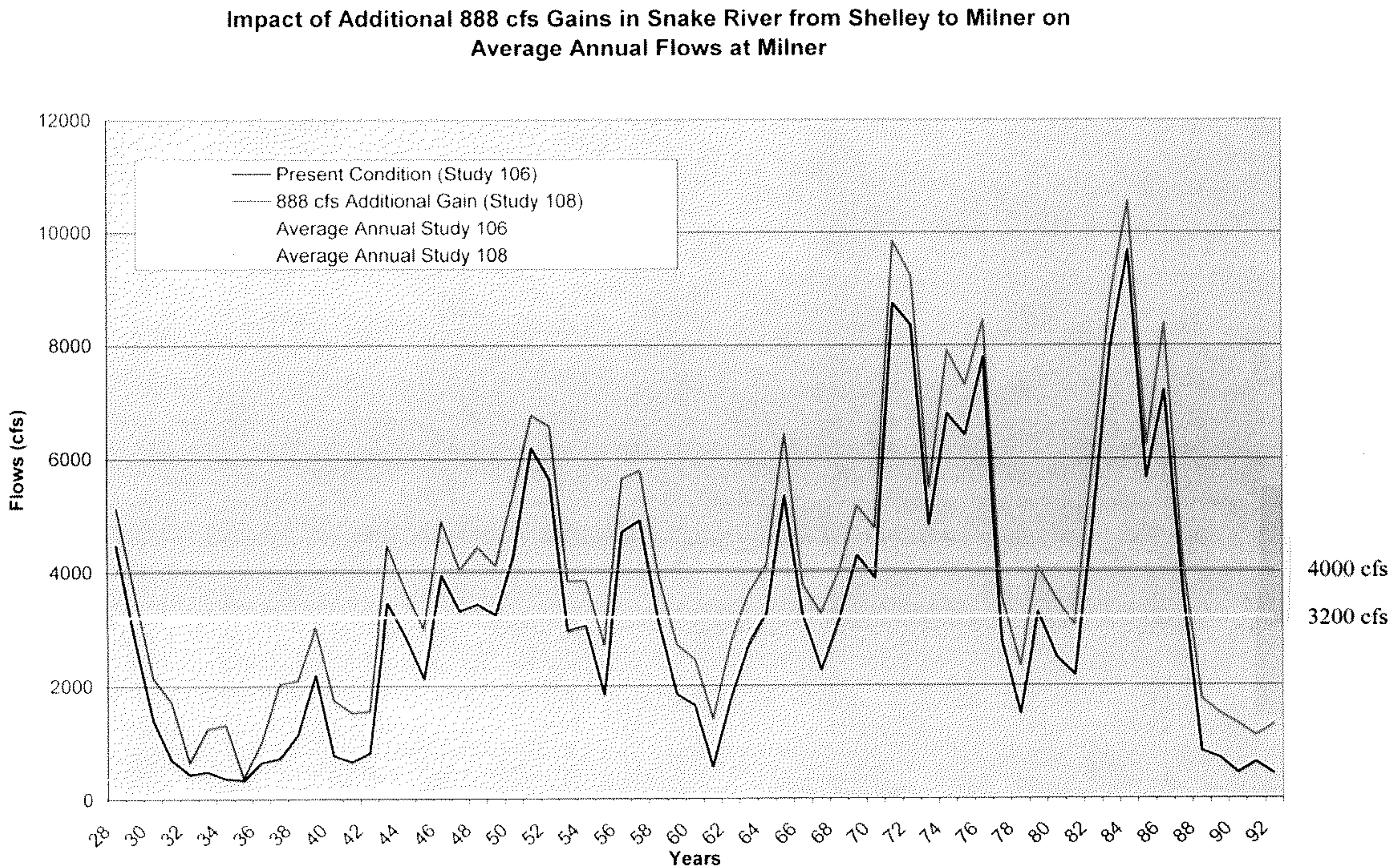
IGWA Exhibit JJ

Transient Increase in Reach Gains above Milner, 1961 Curtailment



IGWA Exhibit KK

Additional 888 cfs Gains Analysis



IGWA Exhibit LL